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## **Soviet Union**

### ***AVIATION & COSMONAUTICS***

No 11, November 1987

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# Soviet Union

## AVIATION AND COSMONAUTICS

No 11, November 1987

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[The following is a translation of the Russian-language monthly journal, AVIATSIYA I KOSMONAVTIKA, published in Moscow. Refer to the Table of Contents for a listing of any articles not translated.]

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## AVIATION AND COSMONAUTICS

### Restructuring of Socialist Competition Is Continuing

91440065a Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 11, Nov 87 pp 1-3

[Article by Col Gen Avn L. Batekhin, Military Council member, chief, Air Force Political Directorate: "October Continues in Our Works"]

[Text] The Soviet people and all progressive mankind are celebrating the 70th anniversary of the Great October Socialist Revolution with the greatest love and pride, with inexhaustible faith in the triumph of the ideals of communism.

The living, organic relationship between our yesterdays and todays, between the accomplishments of Great October and the changes presently occurring in all spheres of Soviet society, is unbreakable, indissoluble. "In terms of the depth of its revolutionary essence, in terms of Bolshevik boldness of the plans, in terms of humanitarian social orientation, the work presently being done," it was emphasized at the January (1987) CPSU Central Committee Plenum, "is a direct continuation of the great things that were begun by our Leninist party in those October days of 1917."

Air force personnel are laboring persistently together with all laborers and with soldiers of other armed services to complete the complex and important tasks of restructuring and renewal, of dependable protection of the peaceful creative labor of the Soviet people, our friends and our allies. To continue the work of October honorably means, in the minds of pilots, engineers, technicians, mechanics and specialists in communication and in air force rear services, always living one's life and service in accordance with Lenin's teaching on defending the socialist fatherland, making a real effort to study military affairs, preserving and multiplying the remarkable revolutionary, combat and labor traditions of the party, the people, the armed forces and the air force, decisively raising the combat readiness of air formations, units and subunits, and ensuring their constant readiness to ward off any transgressions upon the sovereignty of the Soviet state.

The desire of military aviators to march in step with life has found a real outlet in the jubilee socialist competition under the slogan "We will implement the decisions of the 27th CPSU Congress, and commemorate the 70th anniversary of Great October with selfless military labor!"

Accepting and fulfilling difficult pledges, soldiers, scientists, engineers, technicians and associates of military educational institutions, services and air force aircraft repair enterprises have perceived this to be a possibility for demonstrating, through practical works, their faithfulness to the party's strategic course toward acceleration

and restructuring, and for participating personally in transforming the energy of plans into the energy of actions. An example of a thoughtful, creative approach by commanders, chiefs, political organs, party committees and buros to organizing competition was demonstrated by the aviation collectives in which communists P. Deynekin and A. Kudryavtsev, A. Drozdov and V. Buvarov, N. Malin and V. Takki, and V. Chernyy and V. Maryasov serve, as well as by the collectives of the Barnaul Higher Military Aviation School for Pilots imeni Chief Marshal of Aviation K. A. Vershinin, the Kiev Higher Military Aviation Engineering School, the Vasilkov Military Aviation Technical School imeni 50-Letiye Leninskogo Komsomola Ukrainy, and the aviation repair enterprises led by officers V. Vasilchenko, P. Voronko, V. Kupch, V. Mironov and A. Chebotnikov. These aviation collectives have been able to fulfill their pledges in honor of the noteworthy jubilee better. This was possible owing to the conditions created by the high requirements on the quality of combat training missions and on all forms of support to combat training and the life of the troops, and owing to the criteria used in comparative assessment of the results of socialist competition, which are stiffer than they were a year or two ago.

I would like to recall that in recent years our party has adopted and is now implementing constructive measures directed at developing the creativity and initiative of the masses and labor rivalry in the collectives as much as possible. This was reflected in a number of decrees of the CPSU Central Committee—documents of general party and methodological significance that determine the main directions in the efforts to improve the organization and leadership of competition. Their requirements pertain fully to the activities of all commanders, political organs, staffs and party and Komsomol organizations in the air force.

Directives of the 27th CPSU Congress and of subsequent CPSU Central Committee plenums calling for all-out activation of the creativity of the wide popular masses, an increase in the role of the human factor as one of the most important prerequisites of our forward progress, and attainment of increasingly higher end results in labor lay at the basis of the new guidelines for organizing and conducting socialist competition in the army and navy.

In this connection there is an evident need for analyzing the progress of restructuring competition in the troops in light of modern requirements, as has been done for example by some air force units and military educational institutions of the Carpathian, Volga and some other military districts recently inspected by generals and officers of the air force's political directorate.

There can be no doubt that there is experience deserving of attention and dissemination in organizing socialist competition and its management by military councils and political departments of the district air forces. Thus glasnost has risen noticeably in competition among air

subunits and units of the Carpathian Military District, where the experience and accomplishments of the best aviators and progressive military collectives are demonstrated and publicized in a better way. Competition on tasks and standards of flight training exercises and planned flying are organized thoughtfully and efficiently using objective testing resources in the regiment in which officers Yu. Bratashov and A. Kryzhanovskiy serve. Socialist competition and summarization of its results are organized especially well, effectively and at a modern level in this regiment's 2d Squadron.

Commanders and political officers of the unit and of the party and Komsomol organizations are actively utilizing the diverse forms of moral stimulation. Numerous flight crews have joined a competition for the right to enter their sortie into the flight book of Hero of the Soviet Union Captain V. Shirayev, one of the regiment's own. Perpetual banners are awarded in the squadrons to the crews and the specialists who did the best work in the month. A special pennant is raised on the flagpole in honor of the best squadron.

The glasnost of competition, and demonstration of and publicity on the experience and accomplishments of the best, have also improved noticeably in military educational institutions and units of the Volga Military District's air forces. The fact that collective and individual pledges and progress in fulfilling them are now being publicized more effectively and visually at the take-off point and in the headquarters and Lenin rooms should be noted as one of the positive steps forward. Thus, the results of competition in combat use are visually displayed on a specially devised stand in the training regiment of the Balashov Higher Military Aviation School for Pilots in which Officer V. Totskiy serves. Evening celebrations honoring the best performers are conducted here in a very interesting manner, in a holiday atmosphere. Flying competitions among cadets in squadrons of this regiment are highly effective.

They went even farther in the unit in which Officer B. Sibiryakov serves: They run practical tests on their procedures and criteria for comparative assessment of competition results, ones which in the opinion of the commanders and political workers preclude subjectivism in determining the winners. It may be too early to suggest that the procedures they propose are ideal, I think, but there can be no doubt that the reasoning behind them is sound.

But on holidays and jubilees, V. I. Lenin taught, we should not yield to fanfare and speechmaking, forgetting the main reasons why the proletarian revolution occurred. It would be more useful to focus attention on the unsolved problems. Therefore I feel it would be pertinent to talk today not only about the positive experience but also about the shortcomings laid bare by the competition. Despite the accumulated experience and the noticeable shifts for the better in the organization of competition, unfortunately its mobilizing and

educational possibilities have been far from fully realized. Moreover the activities of certain commanders, political organs, staffs and party and Komsomol organizations concerned with managing socialist competition still suffer from excessive emphasis on organization and from formalism, things which CPSU Central Committee General Secretary Comrade M. S. Gorbachev called "the sworn enemy of competition." And mildly speaking, the influence staffs, political organs and administrative party organizations have on the state of affairs in regard to this issue in subordinated units and military educational institutions is low.

What is the main thing that is lacking? Day-to-day leadership, I think, the desire to make the latter an inseparable part of the entire process of combat and political training, to instill a spirit of rivalry in every training day, in every flying shift. An inspection revealed that many communist executives are still trying to organize competition under the new conditions by the old methods.

Quite typically competitors display the greatest activity in the times when the pledges are adopted and when the results are summarized. But in day-to-day life, during which the specific tasks facing the units and subunits are carried out, this activity clearly declines. The requirements of the guidelines that pledges must be challenging and, concurrently, realistic are not being met adequately. As an example an analysis of socialist pledges adopted in the last 3 years by some air force units of the Carpathian Military District showed that the challenge of these pledges is declining, and that as a rule they do not go beyond the tasks planned for the aviation collectives.

We cannot agree in any way with the position of some commanders, political workers and staff officers who say that the only reason for this is the stiffer requirements imposed "from above" and the stricter evaluation criteria. But what about the unsatisfactory and mediocre grades received as a result of failing to fulfill training plans, what about the low results in combat use, and what about the shortcomings in ensuring flight safety? Who is at fault for those? I cannot help recalling the wise counsel offered in that old fable: Rather than pointing the finger at all the gossips around you, would it not be better to mend your own gossiping ways?

Sometimes it also happens that collective and individual pledges are adopted so "cunningly" that there is nothing to do and no reason to compete, because the pledges simply reflect what has already been done. Take for example the training regiment in the Balashov Higher Military Aviation School for Pilots that initiated the competition in the district's air forces: The goals planned for the second training period were lower than those achieved in the first half of the year. Fewer adopted the pledge of becoming outstanding soldiers—5 percent fewer officers, 17 percent fewer NCOs, 6 percent fewer pilots, 3 percent fewer flight crews and so on. What sort of competition is this, and who needs it?

The outstanding rating evades many units for years on end. And last year many initiators of socialist competition were unable to fulfill their pledges.

Among them was the bomber regiment commanded by Guards Colonel A. Labkovskiy. For all the appeals here, no real rivalry is evident among the aviators, the spirit of initiative has not captured all the personnel, and there is no real struggle for flight safety and for high end results in flight training.

There are many worthy examples of selfless labor by servicemen, subunits and regiments in fulfilling current tasks in the aviation collectives. But frequently no one is aware of this experience. And thus we find outstanding, mediocre and lagging subunits coexisting under the same conditions.

The practice of summarizing results suffers from serious shortcomings. What is the explanation, for example, for the fact that as a rule, political workers and not the commanders analyze the course and results of socialist competition whenever the time comes for summarizing the results in the aviation regiment in which officers V. Pushmin and Ye. Remizov serve? Moreover it should be noted that the bulk of the burden of organizing friendly rivalry is borne by political workers. Moreover the progress of competition is documented and monitored not by the unit headquarters but rather by the political department's deputy chief for Komsomol work. The responsibility has been passed as far down as it could possibly go.

Also disconcerting is the fact that many times individual and collective pledges are not aimed at attaining specific high indicators in combat training, being general in nature. The efforts to maintain the precision characteristics of aircraft weapon systems within prescribed limits, which require the participation of a large number of specialists from different services, are clearly lacking. Some pilots offer various excuses not to adopt pledges to attain high results in combat use, limiting themselves to a mediocre level already attained. Significant omissions were also condoned in the organization of socialist competition among specialists of the air force engineer service, communications and the rear. Here as well we find elements of formalism, nonspecific pledges and digression from the priority directions in the fight for raising combat readiness and improving personnel training, flight safety, discipline and organization.

One of the main reasons for these and other shortcomings is that commanders and political personnel in executive positions and the party organizations of district air forces (not only in the districts discussed above) have not displayed adequate persistence and initiative in implementing the directives of the CPSU Central Committee, the USSR minister of defense, the chief of the Main Political Directorate of the Soviet Army and Navy and the commander-in-chief of the air forces concerned with restructuring socialist competition. Study of the

new guidelines and their explanation to the personnel were not distinguished by efficiency. Many aviators never did fully recognize the essence of the new requirements. And the corresponding staffs and political organs were unable to offer a program of specific activities in this direction to their subordinates.

Insufficient effectiveness of ideological support to the process of organizing socialist competition had its effect as well. Positive experience accumulated in the units and subunits is being generalized and disseminated with impermissible slowness. Here is just one fact to think about: Colonel V. Klimov, the best instructor in the aerodynamics department of the Balashov Higher Military Aviation School for Pilots, has been serving in the school for over 25 years, and he has submitted over 100 efficiency proposals. But no one has yet thought of making the experience of this leading officer, a creative person with an inquisitive mind, available to all. In the meantime they cannot understand why Klimov has so few followers.

Oral propaganda on the requirements of the guidelines and on the fundamental principles of organizing competition is weak. For practical purposes cultural and educational institutions are not taking any part in this important work. Some commanders, political workers and active party and Komsomol members are also observed to have a negligent attitude toward visual display of the progress and results of friendly rivalry.

The activity of party committees, party buros and committees, Komsomol buros and trade union organs leaves something to be desired.

Communists and Komsomol members sometimes fail to set the example in competition. Many of them are indifferent to competitiveness, while some do not know how to set high goals for themselves, and sometimes do not wish to do so.

In a word, the organization of socialist competition still remains one of the problems requiring both greater attention and better solution. The possibilities and untutilized reserves for this are available.

The way we need to state the problem is this: To compete means to do more, better and more reliably, with fewer outlays, and to achieve real forward progress. This cannot happen unless we clean the rust of formalism away from the entire mechanism of its organization, create true rivalry in it, and create the conditions which would put the human factor fully into play.

Among the urgent current problems of restructuring competition, the executives of the formations, units, enterprises, military educational institutions and services should turn attention to the persistent need for

shifting the center of gravity of organizational and educational activity into the subunits themselves, to real work with specific people. At the same time we must also think about ways to raise the effectiveness of testing.

Very much depends on the role and place of the staffs and political organs of the formations, units, departments and services in organizing socialist competition. We must make an effort to see that they display constant concern for rivalry in the course of the training process. And the party committees and party organizations of the directorates, staffs, departments and services should increase the demands they impose on communists for restructuring competition in the aviation collectives subordinated to them.

Today, noted Army General D. T. Yazov, a candidate member of the CPSU Central Committee Politburo and the USSR minister of defense, in a report to a meeting of active party members of the USSR Ministry of Defense, we need new approaches in order to sharply improve the status of military discipline.

One of the effective ways of attaining this objective of such great importance to the air force is to raise the educational role and emphasize the moral aspect of socialist competition. Going forward, doing better is an invariable prerequisite of friendly rivalry. But is rivalry in conflict with the desire to share the joy of the success of fellow servicemen, to provide assistance to those needing your help, and to display concern for and attention to young soldiers? An atmosphere of friendly work, creative enquiry, mutual respect and exactingness, which is created and strengthened by competition, is precisely what must become a powerful moral and psychological factor in the fight against negative phenomena in the army milieu, and the means of promoting tighter discipline and organization in all elements of the aviation collectives.

Raising flight safety is the most important sphere of competition. Basing ourselves on irreproachable compliance with the laws of flight service and activating the consciousness and initiative of the wide aviator masses, we need to utilize the creative methods inherent to socialist competition in order to attain high organization and clear rhythm in flying, and guarantee its safety. The spirit of rivalry must literally permeate all directions, all areas of the effort to deeply study and master aviation equipment and armament and the methods of its combat use, to raise the flight training proficiency of commanders and instructors and to achieve effective use of trainer complexes, testing resources and every minute of training and launching time. A dependable barrier must be raised in the course of competition against all laxity and simplifications capable of negatively affecting flight safety.

On holidays we would of course wish to talk only about the good things. All the more so because during the pre-October socialist competition many aviators labored

gloriously, and we are sincerely happy and proud of the new accomplishments of the best elements in the air force. But we should not forget that holidays are followed by routine days, and no one will solve our problems for us. And there is very much work ahead of us.

The beginning of the new training year is not far away. We are embarking upon the next phase of socialist competition among soldiers— the competition for an honorable welcome to the 70th anniversary of the USSR Armed Forces. Therefore it is important to prepare ourselves properly, with regard for the accumulated experience, to begin winter combat training in organized fashion, and to apply all of our effort to successfully fulfill the pledges we adopted for the jubilee. This is the most immediate objective, attainment of which will go a long way to predetermine the pace and quality of development of the air force in the future year.

The cause of October lives and triumphs. All of the objectives stated in decisions of the 27th CPSU Congress and of subsequent Central Committee plenums, all of today's accomplishments in labor and military work by Soviet people and soldiers, their struggle to make truly revolutionary changes in our society, and further reinforcement of the defensive potential of the world's first workers and peasants state are particles of Great October, its continuation. And it is the duty of every aviator to make a substantial contribution to acceleration and restructuring.

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**Fighter Pilots Voice Support for Aerobatics**  
91440065b Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 11, Nov 87 pp 4-6

[Three letters; first two paragraphs are AVIATSIYA I KOSMONAVTIKA introduction]

[Text] The article by Marshal of Aviation A. Silantyev "Aerobatics—Victory, Life, Safety" (AVIATSIYA I KOSMONAVTIKA, No 9, 1987) attracted the attention of readers specializing in aviation. The editor's mail on this problem is interesting and diverse. The authors of the letters pose urgent questions concerned with improving aerobatic training, share their experience and argue with valid grounds that omissions in this form of occupational training for military pilots are having a negative effect on combat readiness.

Three letters sent to the editor reflecting the most characteristic viewpoints of aviators on the raised problem are offered to readers below.

**"The Foundation of Success in Combat," by Lt Col A. Smiltniyeys, Military Pilot 1st Class**

Once during an exercise I witnessed an interesting incident. Two groups of fighters engaging in combat were converging on collision courses. The airplanes controlled by Major V. Smirnov's pilots surpassed the "enemy" warplanes in range of fire. It was on the basis of this advantage that the group's tactical plan was formulated. The rivals on the other hand, knowing the strong side of those with whom they were to enter into combat, included jamming resources in their order of battle, keeping them concealed until a certain moment.

Having detected the "enemy" from considerable range, V. Smirnov's group did everything it needed to to prepare its weapons for fire, and then at an opportune moment it subjected to the opposing group to simulated intensive rocket fire. Several seconds passed. During this time the airplanes had converged to moderate range, and by all calculations the rockets should have reached the targets. But just at this moment the jamming resources were put into play, with the anticipated impact: Theoretically, guidance of a guided weapon could be disrupted, and this was confirmed to have taken place later on by the flight recorder.

Now the aircraft were close enough that short-range missiles could be effective. Fluid aerial combat began. The pilots opposing Officer Smirnov's group, who possessed outstanding aerobatic skills, maneuvered with greater efficiency, energy and coordination. And as a result they were victorious. This victory was to be expected, because it was prepared for by competent compensation of shortcomings in the equipment through the use of jamming resources and by artful conduct of close combat, which is founded on aerobatic proficiency.

Were we to study the combat training procedures used by pilots of our probable adversary, we would be persuaded that close aerial combat is practiced not as just one of the forms of occupational training but as its principal element. Advanced and higher aerobatics occupy a significant place in the overall training program.

Here is one other case. Two subunits flying airplanes of equal capabilities entered into aerial combat under equal conditions. In accordance with their commander's plan, Captain G. Arakin's pilots began converging with the "enemy" with enviable purposefulness, each pilot selecting his own target for a missile strike from maximum range. On the other hand Major Yu. Ovcharkin's group, rather than trying to outrace the "enemy" on collision courses, initiated a kind of frontal maneuver uncalled-for by the situation.

Consequently just a few seconds later the tactical situation became totally incomprehensible to Captain Arakin's pilots. Some were unable to lock on target, while others had to quickly find new targets.

Following their plan and separating into several small groups, Major Yu. Ovcharkin's pilots attacked the combat formation of their rivals from different directions, including from long range. G. Arakin's subunit was compelled to open the formation out, but the "enemy" had already selected who was going to fight in close combat with whom. Success was clearly on the side of the subordinates of Officer Yu. Ovcharkin. This became all the more obvious when one group that had executed a missile strike from long range and was subsequently able to escape to a position outside the "enemy's" zone of control entered into combat. It was now able to effectively augment the effort at the focal point of the combat, where the situation had grown more complex for the rest of Ovcharkin's subordinates.

Let us summarize some of the points made here. The first conclusion is that in modern aerial combat, close aerial combat is as much expected as all other forms of struggle in the air. Massed use of aviation would create such a large flow of targets that annihilating them all from great range would be impossible even under favorable conditions. Use of all kinds of interference would significantly reduce the fighting capabilities of long-range missiles and even short-range missiles. Then aircraft guns, which all of the latest airplanes of the probable enemy possess, would come into play. Moreover the possibility is not at all excluded that the enemy might be detected at short range, making it necessary to enter into close aerial combat right away. And consider the case where all missiles are expended during combat. At such a time, guns would be irreplaceable.

No, close aerial combat has not yet faded into history.

The second conclusion is quite simple: Ninety percent of close aerial combat is the art of higher aerobatics. But even in a long-range duel, aerobatics are both a means of defense and a way of seizing the initiative. The fact is that without a serious background in aerobatics, implementing the basic tactical principles of surprise, initiative, decisiveness and aggressiveness would be unimaginable.

Combat is not the only area in which advanced and higher aerobatics are required. I have limited my discussion of aerobatics to their relationship to aerial combat only because this is an area in which the laws of combat training are not optional—they are dictated uncompromisingly.

Success in combat depends on the proficiency of maneuvering. And maneuver is a derivative of the art of aerobatics. Aerobatics are an independent factor that determines all other functions of combat and of the air warrior. Such is my point of view, and such is the program of professional improvement.

**"What Is the Source of the Mistrust?", by Maj A. Arestov, Military Pilot 1st Class**

I feel that I have been lucky in my flying career: Ever since I was a lieutenant I have spent a great deal of time on advanced and higher aerobatics. My own experience once made me wonder if there could ever be opponents to aerobatics.

At first glance one would think that there could not be any. But then I recalled that even I have encountered "detractors" of this form of flight and combat training. Where does this strange attitude toward the obvious come from? The answer to this question did not come to me right away. But now I have come to understand some things, and I have been able to work some of the questions out.

Much of the problem has deep roots. It is no secret that out of all persons wishing to become military aviators, some fail to pass through the sieve of occupational selection. But even among those who have passed favorably through this psychological maze, there are many (including cadets who have undergone a certain amount of flight training) who wash out because of an inability to fly, and mainly because they are unable to land.

But it is extremely rare for pilots to wash out if they have crossed the landing hurdle. Diligent and experienced instructors can shape almost hopeless cadets into fighter and fighter-bomber pilots. The question, then, is whether everyone who has mastered take-off and landing can master higher aerobatics.

I think that aerobatics are not simply one of the forms of flying, but the hardest of them. We know that a "sense of flying" lies at the basis of successful assimilation of our profession. This sense of flying manifests itself chiefly as the ability to form internal visual images of flight, relying upon which a pilot's mind learns to work as required by the profession. But the specialty of flying is itself extremely multifaceted as well. We can suppose that higher aerobatics require not only the capability for thinking in images but also the ability to manipulate these images quickly. In this case the rate at which the "frames" supersede each other is challenging not only because of the high speeds involved but also because of the variable and differentiated rhythm forced upon the pilot by the airplane's dynamics. The more maneuverable the airplane is, the more the pilot's capability for manipulating flight images must be developed.

Consequently not every pilot who learns to land can perform all of the maneuvers of higher aerobatics. And if we add to this the effects of high accelerations, which reduce all forms of performance, including the intellectual possibilities of the individual, the difficulties grow immeasurably.

And now let us consider that the known properties of the mind required for performance of higher aerobatics are limited. Take for example the commander of an aviation collective. Naturally the yardstick he uses would be his own training level. And knowing that aerobatics are difficult for him (a highly experienced individual!), and that he had made mistakes on several occasions trying to learn aerobatics—sometimes very dangerous ones at that, he would hardly be an ally of aerobatic training, and even more so in regard to young aviators—his subordinates, for whom he is responsible. There can be no doubt that such a commander would be an opponent of advanced flying techniques. To make matters worse, "persuasive" arguments reinforcing his position are available to him: the existence of long-range missiles, the experience of some local wars interpreted one-sidedly, flight safety information, and a certain amount of moral support from some subordinates and higher chiefs. Man is a great master of justifying his desires. And this self-deceit becomes first a conviction and then an "anti-aerobatics policy" that is confidently and persistently pursued in the subordinated collective.

Do such commanders ever give a thought to what would happen in real combat? It is quite possible that they do, but when they do, they think approximately like this: Combat is but a potential situation in the future, while the complexity of flying, the safety of flight work and a commander's responsibility are objects of concern today, tomorrow and every day.

When training in aerobatics is performed not haphazardly but constantly, concretely, a number of interesting details come to light. For example we find that some pilots are better adapted to bearing left in group flight, while others are better suited to bearing right. Some find it easier to maintain a sharp bearing angle, while others find it simpler to fly straight ahead. Some pilots who perform aerobatics fabulously when flying alone are not very successful in group maneuvers. And then there are those who feel themselves to be at their best when following in a group maneuver.

What does all of this say? In my opinion, simply that the sky requires different talents, and that any gift will be put to worthy use in the hands of a competent commander. Few have all of the required talents. The commander must have a thorough knowledge of his pilots, and of all their occupational features.

Therefore I do not feel that there are aviators who cannot fly maneuverable aircraft. What we need to do is accurately determine the limits of each pilot's possibilities, we need to find individually tailored ways to form the needed professional qualities, and we need to find those combat roles in which the pilot is personally most effective.

Each of us is unrepeatable, unique in some way. But all of this can be revealed only through comprehensive combat training, in which the final word belongs with the sole unquestionable authority—modern combat and its laws, principles, requirements and arguments.



Any other approach would restrict talents, create illusions and open the door to ambitions and prejudices. In other words, any other approach would not promote victory in combat.

**"Not a Day Without Aerobatics," by Capt V. Shcherbina, Military Pilot 1st Class**

I have never heard anyone openly declare that he was against aerobatics. That may be because I have spent my entire flying life in fighter aviation, where I think maneuver is most widely accepted.

But while being "pro" in their words, many find ways to organize combat training in such a way that hundreds of "cons" overshadow dozens of these "pros."

"Pro"—this is the truth, which says that aerobatics is as necessary to the fighter pilot as is air itself.

"Con"—this is saturation of the flight training plan with all kinds of different forms of flying, the whims of weather, the particular features of the deployment location, mistakes made in aerobatic flying, near-accidents, time restrictions that sometimes remain in force for years, operation of propulsion units in extreme conditions, interruptions in flying, inadequate training, and so on.

It would be unprofessional to simply reject these "cons." All of these things are not from the realm of fantasy. They are real, in many ways objective difficulties which do in fact create obstacles to aerobatic proficiency.

But if we consider the purpose of fighter pilots in combat, we would have to agree that the task of assimilating advanced and higher aerobatics requires a search for solutions, and not arguments suggesting that this could be postponed, and treated as something secondary, or at least not with the top priority.

My friends and I have talked many times about how to improve aerobatic skills. To many of us, this does not seem to be such a difficult problem.

First of all I think that flying the standard number of aerobatic sorties specified by the documents must become the law. Not an indicator that the pilot must satisfy by some point in the course of the year, but a systematic form of training. We need to make it an immutable rule that the plan for the first flying day of every month in weather permitting advanced aerobatics (including above cloud cover) must include the corresponding exercises. Only after he finishes such flying should other forms of flight training be planned for the pilot.

Another idea. The minimum foreseen by the plan must not be treated as being adequate for a fighter pilot. The minimum is always only a minimum. And fulfilling the

minimum by 100 percent is not an excuse for celebrating. This is only the level above which pilots in fighter aviation are not grounded. But be that as it may, this minimum must be adhered to strictly in aerobatic training. And the minimum must be satisfied not at the end of the year, but when summarizing the results of each month. Moreover flying assignments carried out to satisfy the minimum requirements of the program must be purposeful and saturated with a large volume of aerobatic work. Following such a flight, however, it should not be assumed that the aerobatic training requirement has been satisfied for another month, until the date that new plans and schedules are drawn up. I think that flights conducted for the purposes of aerobatic training must invariably require work on new, increasingly more advanced maneuvers (in terms of both their form and their dynamic parameters) and on the transitions between these maneuvers.

And in the course of fulfilling the monthly flight training program it would be suitable to constantly maintain and upgrade the aerobatic proficiency of pilots by combining several exercises together. If weather allows, I am sure it would be quite realistic for a fighter pilot to include several aerobatic maneuvers, or some element of a previously assimilated aerobatic routine, in his flying assignment.

There is one argument I would like to present in favor of aerobatics. I have never come across an excellent aerobatic pilot who has difficulty assimilating other forms of flying. But situations on the other side of the fence are not all that rare. This suggests that aerobatic flying impacts all of the qualities of a pilot in their integration, and that proficient maneuvering is an essential foundation for the formation of other capabilities.

It was not my purpose to show all the ways of improving the principal skill required of pilots flying maneuverable airplanes. All I have tried to say is that there is absolutely no freedom of choice when it comes to aerobatics.

Combat is the life's purpose of a fighter in a wartime sky, and combat calls primarily for maneuver; therefore we can confidently say that maneuver is the life's purpose of an air warrior.

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11004

**Benefits of Well-Organized Tactical Flying Exercise**

91440065c Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 11, Nov 87 pp 10-11

[Article by Col A. Tareyev, military pilot 1st class:  
"Examination Above the Sea"]

[Text] The fragmentary order transmitted from our headquarters was succinct: hit "enemy" ships in a certain region. Considering where it was based, frankly speaking the mission was somewhat unusual for the bomber subunit. But orders are orders.

The entire staff took a hand in drawing up the plan. They tried to estimate the situation as accurately as possible from the very beginning. The main question was how much time we had for preparations prior to take-off. The answer came from higher headquarters: the time it would require the "enemy" to prepare for an assault landing operation and to conduct it, as specified by the existing standards.

Having analyzed the situation once again, we adopted a preliminary plan. We concluded from the available data that in order to complete the assigned mission we had to move part of the forces to a secondary airfield, from which we could hit the prescribed objectives more effectively. We also had to carry out the necessary calculations to determine the choice of weapons, and we had to make sure that the flight crews were ready to fly to the unfamiliar base.

The main burden was shouldered by the staff officers during this period. The final result of the actions of the entire military collective depended in many ways on the effectiveness of their organizational work. Therefore, after transmitting instructions to prepare for take-off and to redeploy, the staff immediately began working on the plan of the combat operations. All preparations were completed by the appointed time. Now came the moment to begin carrying out the mission. It was assigned to a squadron of proficient pilots headed by Major A. Senchenkov, military pilot 1st class.

Having redeployed the subunit to the indicated airfield, the squadron commander and the staff began the immediate preparations for carrying out the assignment. During this period it was important to obtain the fullest possible intelligence on the "enemy" and to select the weapons with regard for this information. Squadron navigator Officer I. Suraykin suggested one configuration of weapons, but the umpire would not give it his approval, pointing out that the proposed variant was effective only in good weather. The fact was that the squadron was to operate against naval targets far from the coastline, where the weather is insidious and changeable. A nonstandard solution was needed. After additional calculations a new weapon configuration was determined. During this work, aviation armament specialist Officer V. Bulavintsev displayed reasonable initiative and far-sightedness. He offered reasonable arguments in favor of using the selected weapons, with regard for their availability at the new airfield. He was also the one who had foreseen preparing an ammunition reserve beforehand.

The rising sun lit up the mountaintops, but only for an instant, since they were immediately obscured by clouds. Major A. Senchenkov looked at the sky somewhat anxiously. His concern was understandable. It was bad enough that this was to be the first time many of the aviators were to carry out such an assignment, but to make matters worse, the weather was preparing to introduce some insidious complications into the scenario.

Visibility was minimum. Nonetheless the crews updated their mission in regard to the specific conditions and took their places in the cockpits.

The squadron commander was confident in his subordinates, but he was still plagued by anxiety. It must be said that there was good reason for it. Events of the last tactical flying exercise were still fresh in his memory. That time the mission posed to the squadron was generally not all that difficult—hitting targets on a familiar training ground. But the crews were unable to earn more than just a satisfactory grade: The assignment was not completed all the way, because some of the aviators were unable to identify their targets.

The critique revealed that the failure was a consequence of inadequate analysis and consideration of the weather conditions. Moreover some of the bombers were "knocked down" by "enemy" anti-aircraft weapons. The subunit had to work a great deal after that bitter lesson in order to reveal and eliminate the mistakes in the training process. How well they managed to do this would be determined by this day's flying.

The signal for take-off came in from the command post. The missile carriers took off into the gloomy sky one after another. Soon the weather scout transmitted that a low fog was hanging over the target area. Senchenkov gratefully recalled those who had insisted on furnishing the aircraft with weapons making it possible to carry out their mission under such weather conditions, which had now become allies of the aviators in surmounting air defenses.

The work was proceeding at full steam at the command post as well. The combat control officer reported that traces from the aircraft had disappeared from the screen. But this information did not seem to bother the umpire, who was looking on. Glancing at his watch, he surmised that the group had gotten within range of air defenses and had begun maneuvering, utilizing the topography along the coastline for cover.

Data indicating that the airplanes were on their target approaches came into the command post, but there were no reports on how their mission was proceeding. They would be over their targets any second. What happened? But the agitation of the control group turned out to be uncalled-for. Just a moment later the radio silence was broken:

"This is Two-Zero-Six, the targets are maneuvering, they are in the area, the sights are locked on.... Got it!"

Confirmation followed immediately after:

"Two-Zero-Six performed excellently!"

The confidence of the leader and his precise determination of the location of the targets and of the sight settings also helped his followers in their aimed strike. I have

been persuaded many times in exercises and in day-to-day flying how well the confidence of the commander and the personal example he sets affect his subordinates. This is doubtlessly one of the important psychological factors promoting victory in combat.

Taxiing to the parking pad, the crew reported mission accomplished. The senior chief gave a high score to the competent actions of the pilots and navigators led by officers V. Kulazhenek, G. Bukharin and A. Igolkin. Concurrently he noted that the crew consisting of Major N. Gorokhov and Senior Lieutenant S. Belinskiy did not achieve the required bombing results; moreover it had suffered a simulated hit by "enemy" antiaircraft weapons.

Why? Officers Gorokhov and Belinskiy did have high class ratings, and they had attained good indicators in combat training many times. Analyzing their actions together with the squadron commander, we came to the conclusion that the pilot and the navigator had put too much trust in the readings of the main sighting system while in the air, and failed to utilize the back-up systems. As a result they were unable to accurately determine the place to begin their maneuver upon coming within range of "enemy" antiaircraft weapons. This confirmed the old aviator's truth once again: Before taking off, while still on the ground, the crew must foresee all of the nuances, and know how to use the airplane equipment in integration. The mistake made by Gorokhov and Belinskiy was analyzed in detail together with all the flying personnel.

One more scenario input was introduced by the umpire: The "enemy" had begun preparing to land his assault forces at the start line. This meant that the bombers would have to strike targets right next to the coastline. On one hand this was easier than attacking ships on the open sea, while on the other hand the task was complicated by the fact that clouds were getting thicker and dropping ever lower in the target area. Visibility was getting worse.

Weighing the possibilities of his subordinates, and thinking out the preparations for take-off, Major Senchenkov decided to make the strike with a flight and to approach the targets from the shore at minimum altitude—that is, to carry out the bombing run by the "top mast" method. The mission was assigned to Major A. Fedorov's group, which consisted of crews manned by officers V. Rybnikov, A. Konovalov, G. Padalok, N. Litvyakov and A. Sefastyanov. The aviators had not mastered this bombing method before. The question arose: Why did the squadron commander make such a decision? As it turned out, the squadron commander had read a great deal about this method, which was used by pilots during the Great Patriotic War. He took the experience of the veterans as his outline, carried out the appropriate calculations and, most importantly, he had prepared Major Fedorov's flight for precisely such minimum altitude bombing beforehand, in the course of planned flying.

The senior chief gave his approval to the decision. It required a change in the combat configuration. This is when the reserve ammunition load which Major V. Bulavintsev took the trouble to stockpile before the exercise came to good use. While the crews were making the final preparations for the mission, engineering and technical officers headed by Captain A. Filatov prepared the airplanes for take-off, which they did far below the standard time. Owing to this, the aircraft were able to take off on their assignment on time. Information was soon transmitted from the training ground persuasively confirming the correctness of Major Senchenkov's decision.

The day was coming to an end, but the intensity of the tactical flying exercise continued to grow. A report that the "enemy" had landed ashore came in at twilight. An air strike had to be made against his forward subunits immediately. This job was to be done by fighter-bombers, and the bomber crews were to illuminate the targets. To be honest, this was not a simple task. Moreover because low clouds were hovering over the area of combat activities, the illuminating flares had to be dropped above the clouds, and their trajectory had to be calculated in such a way that the flares would ignite beneath the clouds.

This task was assigned to a crew consisting of pilot Captain V. Kulazhenek and navigator Senior Lieutenant V. Bukharin. Note that once again the squadron commander's choice was not accidental. This crew had undergone specialization in carrying out such tasks in the course of its training, and it had earned the highest points in combat use over a certain period of training. The crew performed excellently this time as well.

The quality with which all tasks of the tactical flying exercise were carried out was good. But are our results always so high? Unfortunately not. Analyzing the lessons of previous tactical flying exercises one is persuaded that we sometimes lack stability. Take at least the example presented above, the one where the weather situation at the training ground changed. What was responsible for the carelessness? First of all the fact that we had superficially analyzed the conditions for fulfilling the assignment, and limited ourselves to a general assessment of the situation. As a result we failed to account for the important fact that the base airfield was located in a climatic zone characterized by winter conditions, while the targets had to be struck on a training ground located in a place with a hot climate. This was totally unexpected by the crews; hence their confusion and lack of confidence.

Moreover the aviators had prepared to make their strike using a sighting device that was effective against highly contrasting targets, failing to devote any attention to integrated use of the entire sighting system. The weapons were also all basically of the same kind, which made it impossible to change altitude and speed to permit target identification while in the air (this was owing to safety

requirements concerned with using the ammunition). Nor did the staff devote adequate attention to change in the tactical situation. Hence the ineffective maneuvering when crossing through the air defense system.

Preparation for attacks on different objectives requires constant and persistent attention in the course of day-to-day training, and especially during tactical flying exercises. If we wish to attain high quality in combat missions, we must prepare for exercises ahead of time.

I persuaded myself from my own experience that we need to specialize the training of pairs and flights—that is, we need to prepare crews and subunits to execute a specific kind of mission. For this, it would be suitable for each squadron to have tactical groups capable of carrying out what we might call out-of-the-ordinary assignments. After outstanding results are attained in one specific form of combat use, the effort should be switched to assimilating the next form. The conveyor method of training the crews, where flight personnel go through the combat training program with their afterburners on, so to speak, cannot in my opinion produce stable indicators in improving the proficiency of the aviators.

Here is another problem that should be addressed. It was demonstrated a long time ago that developing the scenario of a situation in real time, and not on an arbitrary schedule, has important significance to preparing and carrying out the plan of a tactical flying exercise. In other words the personnel need to act not in accordance with an arbitrarily written schedule but rather as required by the specific situation, inasmuch as any arbitrariness is a hindrance to raising combat proficiency. Speaking frankly, however, this is not the way things always are.

The following pattern may often be observed in a tactical flying exercise. The mission has been posed, and the aviators have immersed themselves into the theoretical aspects of the situation. Then a sudden jump is made in operational time, and practical work begins. And yet, experience persuades us that there should not be any sort of artificial jumps. The intensity of the work must remain high both during preparations for and in the conduct of the exercise. This makes it possible for every aviator to experience and get a feeling for all of the stages of the fast-paced activity, and it develops the moral and physical steadfastness of the personnel in the face of the difficult conditions which would be unavoidable in real combat.

The tactical flying exercise is the culmination of the work of the entire military collective over a particular period of time. In order that the tactical flying exercise could become a real examination of combat maturity, we must relate most seriously to its organization and conduct. Understanding this, we try to avoid formalism and simplification in training, and we try to extract lessons from our failures. Practically speaking it is hard to

restructure on the move. But this must be done, inasmuch as there is no limit to perfecting military proficiency. Elevating the process of combat training to a new qualitative level is the will of the times. This means that we have no right to stop half-way.

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11004

### **Book Discusses Development of Air Reconnaissance**

91440065d Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 11, Nov 87 p 15

[Review by Col N. Korchevoy of book "Baryery vozduшной razvedki" (Barriers to Air Reconnaissance) by A. B. Krasnov, Moscow, Voenizdat, 1987, 177 pages, 80 kopecks]

[Text] In what manner did the tactics of air reconnaissance develop in the past? Under the influence of what factors are the methods and tactics of reconnaissance changing today, and what is their future? How are tactics themselves affecting aviation equipment? The answers to these and similar questions can be found in the book "Barriers to Air Reconnaissance" published by Voenizdat.

Its first part presents the most important problems of tactics or, as the author refers to them, the barriers to air reconnaissance which scouts face as they surmount enemy air defenses and search for camouflaged and concealed objects, and which hinder full utilization of the fighting capabilities of new reconnaissance airplanes and reduction of the intelligence gathering time. Thus it is no accident that the author used chapter titles such as "Air Defense," "The Invisible Enemy," "New Technology" and "Time," each of which discusses its own specific problems.

The difficult issues are discussed comprehensibly and persuasively, using large quantities of facts from the experience of past wars. The abundance of facts and figures makes the presentation more interesting and substantial. The author tries to reveal the most complex problems of tactics; sometimes he speculates, inviting the reader to look at the development of tactics from an unexpected angle, to consider it from an unaccustomed point of view.

For example, what would the tactics of air scouts have been like during the Great Patriotic War, had they possessed modern jet airplanes? Or on the other hand, how would frontline Pye-2 scouts have operated, were they opposed by modern surface-to-air missile complexes and supersonic fighters? And finally, looking ahead into the 21st century, would we be able to quickly reorient ourselves, and utilize tactics presently unknown

to us? Revealing the patterns in the development of tactics with such examples, the author arrives at his own original conclusions on the basis of which to make his forecasts.

The second part of the book is of special interest to the military reader. It examines the components of the tactical proficiency of aerial scouts, beginning with flight preparations and ending with the report on reconnaissance results. The reader finds many examples here from combat training experience and recommendations on modeling the reconnaissance flight, utilizing military cunning and searching for small objectives. One section defines the place of risk in air reconnaissance, the role of creativity and initiative in the development of tactics, and the significance of the psychological compatibility of crewmembers and their high responsibility for reconnaissance results.

The author knows the subject of his discussion well. He has been working eagerly in this area for a long time, and he possesses considerable war and postwar experience. The style in which the material is presented steers clear of pedanticism and didacticism, and it is embellished with subtle irony when the author refers to facts worthy of it and tries to make the reader a participant of his deliberations.

But there are some things about the book which are repetitive. Perhaps out of a desire to ensure full explanation of the subject matter. This flaw should be kept in mind in future work. Nonetheless despite the diversity of the topics covered in the individual chapters of the book, it argues logically and persuasively that development of the tactics of air reconnaissance is a matter of the aerial scouts themselves. A constant search for innovations in tactics and the impermissibility of stereotypy must become a conscious need to them.

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**Adaptation to an Aircraft's Changing Parameters**  
*91440065e Moscow AVIATSIYA I KOSMONAVTIKA*  
*in Russian No 11, Nov 87 pp 16-17*

[Article by Lt Col N. Litvinchuk, military pilot-instructor 1st class, candidate of technical sciences, and Maj Med Serv V. Kozlov, candidate of medical sciences: "How Do You Adapt to an Airplane? (A Reader Raises a Problem)"; first three paragraphs are AVIATSIYA I KOSMONAVTIKA introduction]

[Text] "The theory of military affairs must be mastered.... This is necessary in order to assimilate new kinds of weapons and equipment faster.

"...An officer who is inadequately prepared in terms of general education and in military respects may be incapable of command, a hindrance to technical progress."

(From a speech by USSR Minister of Defense Army General D. Yazov at a meeting with cadets, commanders and instructors of the Moscow Higher Combined Arms Command School imeni RSFSR Supreme Soviet.)

The following incident comes to mind. This was another in a succession of solo flights for Cadet M. Samokhvalov. The instructor, who remained on the ground, was relaxed. His pupil had raised his craft into the sky five times before this, and each time he acted competently. But the teacher was not to relax long. When Samokhvalov landed the airplane, it was found that he had made a number of serious mistakes in piloting the missile carrier. Why is it that after a few solo flights preceded by paired flights with the instructor, in which the cadet demonstrated good piloting techniques, the quality with which he controls the airplane decreases dramatically. Why does one cadet lose control of his airplane when a control system fails, while another is able to handle the problem successfully?

There is a great need for analyzing problems brought up in flying practice. The interests of attaining high effectiveness in preventive measures directed at raising flight safety require this.

Considerable flying experience and psychophysiological research lead to the conclusion that the phenomena noted above are based on a process of information interaction between the pilot and the airplane. Let us examine the essence of this process in greater detail.

The dynamic properties of an airplane vary within a rather wide range in the course of each flight. This is so because these properties depend on the flying height and speed, the load on the aircraft, remaining fuel, the state of the control system and so on. As a result the pilot must constantly adapt himself to the aircraft irrespective of the level of his occupational training. Considering this, it would be suitable to examine how the pilot determines changes in the airplane's properties and how he accounts for them in flight.

The pilot pursues a fully definite, consciously posed goal as he manipulates the airplane's controls. Therefore after every controlling movement he evaluates whether or not this goal has been achieved. he makes this evaluation on the basis of information with a spatial and temporal structure provided by instruments and by other sources. An example of airplane control in the longitudinal channel is shown in Figure 1.

Irrespective of the properties of the aircraft, the spatial structure of the information remains practically constant. Its temporal structure varies depending on the factors affecting the aircraft. Thus Figure 2 shows the dependence of the airplane's response time for angle of attack on flying speed. It must be said that a system design was attempted in which the controlling effect produced by moving the control stick would remain the same while changes occurred in the airplane's properties.



1. Assignment
2. Vision
3. Hearing
4. Vestibular apparatus
5. Kinesthetic
6. Tactile
7. Information reception
8. Information processing and decision making
9. Fulfillment of adopted decision, working movements
10. Pilot
11. Loop



The temporal characteristic of the information has exceptionally important significance to the pilot when in the air. Moreover it is the basis upon which the entire process of adapting to the properties of the aircraft is structured. Information has a unique temporal structure

And so, let us assume that the pilot has determined that the properties of the airplane have changed. Now it is important to adapt to them, so as to maintain precise control of the missile carrier and to ensure flight safety. With this purpose he carries out several trial motions with which he is familiar. Periodically shifting the control stick a slight amount, he waits for the airplane's reaction, which attains a certain magnitude after a strictly determined period of time.

If the signal attains the pilot's sensitivity threshold in less time, he moves the stick a lesser amount and once again evaluates the airplane's reaction, and so on. But if the signal attains his sensitivity threshold in a greater time, or if it is not perceived at all, the amplitude of the motions grows to a value at which the airplane's reaction would occur after time  $\tau$ . Consequently by varying the controlling movements the aviator tries to select the optimum temporal structure of incoming information, and he forms new standards for controlling movements relevant to the altered dynamic properties of the aircraft.

Trial movements could be observed most often in flight recorder data prior to leveling off in the landing phase, prior to performing maneuvers, and the like. In this case the poorer the pilot's habits are, the more trial movements he makes, and vice versa. Test pilots also resort to this procedure when checking out a new airplane.

Thus as the dynamics of the airplane change, the pilot tries not to maintain some optimum characteristics of his controlling movements, but to achieve an optimum time base for incoming information inherent specifically to him, thus preserving his piloting method.

It has been noted that the time constant  $\tau$ , which determines the piloting method of the pilot, depends on his psychological state. As tension increases,  $\tau$  decreases, and for the reactions of the airplane to satisfy the needs of the pilot, the amplitude of the trial movements must be high, and their frequency rises as well. As tension decreases, on the other hand, the amplitude and frequency of the movements decline.

From the standpoint of control theory, such adaptation entails selecting the amplification factor of the control unit. In comparison with a normal flying state, this factor may increase by several orders of magnitude in the case of a pilot in a stressful situation, and elicit undesirable phenomena—excessive rolling of the airplane in particular.

Properties of the pilot's nervous system are the principal factors which determine the temporal structure of information which the pilot tries to achieve. If he has a high temperament, then his movements aimed at creating a particular controlling effect are distinguished by high amplitude and speed—that is, by a shorter time of deflection of the control stick. In this case the controlling effect is attained faster. Attainment of the same controlling effect by a pilot with a lower temperament is characterized by lower amplitude and speed, or a longer time of deflection of the control stick. In this case the temporal structure of the information is more stretched out.

Consideration of this feature has important significance to teaching the cadets. As a rule the instructor tries to impart to each cadet the same piloting "signature" inherent to himself. As a result a cadet trying to satisfy the instructor's requirements begins learning to control

the airplane with the same characteristic movements that are inherent to the instructor. The cadet's personal, individual features are ignored completely in this case.

Later on, when the student begins solo flying, he starts restructuring his piloting technique and working out his own piloting "signature" based on his own impressions. As a result after ten or twelve solo flights in a trainer or four or five flights aboard a warplane, piloting technique decreases sharply in quality, setting the stage for flying accidents, especially in the landing phase, when working movements must be controlled extremely delicately.

To prevent this negative phenomenon, what the schools do now is raise the requirements on the quality of solo flights—that is, they try to maintain the needed quality during the time of the pilot's adaptation to the airplane by enlisting his reserve psychophysiological possibilities, without penetrating into the essence of the problem. In these conditions additional flights with the instructor are planned for the cadet. But there is little sense in doing that.

Obviously the "grandfather" approach, which entails drilling the students with the notorious "do as I do" principle, is a significant shortcoming in cadet training. Experience shows that in flight training, the instructor pilot should devote more attention to letting the cadet develop his habits independently under the instructor's supervision, and to ensuring flight safety. The experience of the best mentors persuades us that the teacher should evaluate the progress his subordinates are making on the basis of piloting quality, rather than on the basis of the structure of the controlling movements; it is even more important not to force the cadet to fly using movements inherent to the instructor. The piloting techniques by which airplane control proceeds more successfully are the ones that should be determined and developed in the cadet right from the start.

Differences in the evaluations given to the actions of a cadet by different examiners may be explained precisely by the fact that an instructor tends to assess piloting quality on the basis of the structure of the student's control, taking as his standard his own idea of what a good control structure is.

The pilot's adaptability in response to trouble in the control system and to rapid, discontinuous changes in the characteristics of the trouble is a no less important question. As we know, energetic interference by the pilot and a tendency to quickly neutralize the consequences of a malfunction result in excessive rolling of the airplane. The main reason for this is the pilot's desire to correct his attitude on the basis of the standards of working movements that pertain to normal airplane characteristics. Naturally such actions do not produce the required result.

Inasmuch as the properties of the airplane change very quickly when control systems fail, the pilot's adaptation should proceed as quickly as possible as well. Consciousness of actions plays a special role in this. We know of cases where a pilot who caused excessive longitudinal rolling of his airplane under natural conditions was unable to reproduce the same result in another flight under identical conditions.

It is noted in the instructions that if the airplane begins rolling excessively, the control stick should be fixed in one position, and after the aircraft's position stabilizes, flight should continue at a different speed. This permits the pilot to adapt himself within a short time to the airplane and to its new, more demanding properties. In some cases when rolling attains a critical value, it may continue in response to self-oscillations of the pilot-control system loop. Under such conditions it is too late to talk about adaptation. The control stick should be released briefly, or it should be fixed mechanically in one position by manipulating the appropriate lever.

Piloting airplanes with different dynamic characteristics but with control systems having identical properties is an important problem. Let us assume that a pilot has acquired stable habits in piloting airplane (I) with certain dynamic problems, and then he flies airplane (II) with different dynamic characteristics, as shown in Figure 2. In this case the second airplane will seem heavier during the landing phase, and the touchdown point may be undershot, and touchdown may occur at too high a vertical speed. And vice versa. Similar situations can also occur in response to the airplane's landing weight, wind shear and other factors. At the basis of all of this lie the structure in accordance with which the pilot accounts for the dynamic properties of the airplane, and the possibilities of adaptation in limited time.

Note that after a pilot spends a long time flying an airplane of a particular type, he develops a strong stereotype of working movements and of adaptation to the airplane's dynamic properties—things which are very hard to get away from, even a conscious effort. Thus for example during the landing phase it is hard for an instructor pilot to consciously make a mistake by way of illustration to the student when he is required to do so by the assignment. As we can see, problems associated with a pilot's adaptation to his aircraft are rather complex. But they must be solved, inasmuch as both the development of air warriors and flight safety depend on this.

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11004

#### **Pilot Rams Intruder, Dies a Hero**

91440065f Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 87 pp 18-20

[Article by Col Ye. Besschetnov: "Gennadiy Yeliseyev's Ram"; first two paragraphs are AVIATSIYA I KOSMONAVTIKA introduction]

[Text] "Dear editor," write officers G. Ivovlev and V. Degtyarev. "It has been mentioned several times in the press that Captain G. Yeliseyev blocked the path of an aircraft intruding into USSR airspace by ramming it with his own jet fighter. But we have never read anything about when and how this happened, and under what circumstances. Could you describe Yeliseyev's life, career and heroism in greater detail?" G. Pritchkin, one of our readers from the city of Kirov, made a similar request of the editor.

An essay on Hero of the Soviet Union Captain G. Yeliseyev is published below.

Fourteen years have passed since that November day in 1973 when communist deputy squadron commander, Captain G. Yeliseyev committed his unparalleled act of heroism. None of those who had known him are still in regiments in which he had served previously, or in his last regiment—fate had scattered them to different corners. But being a reporter, I was able to track down many of them. I have met with Major General of Aviation G. Bednov, in whose squadron Gennadiy Nikolayevich began his career as a deputy squadron commander, with Colonel A. Shchetinin, who replaced him in that position, and with Major A. Shchetilov, who was on duty in the air defense command post at the moment the interceptor was launched against the intruding airplane. Former commander of the air regiment A. Malasay, former squadron commanders N. Kulikov and N. Filin, former flight commander R. Nafikov, former friends and fellow servicemen V. Filinov, V. Kopitsa and V. Rovnyagin, and many others shared their recollections of Captain G. Yeliseyev with me. I had the fortune to hear and tape-record Yeliseyev's last radio exchange with the ground.

The stories and recollections of individuals who had served with this valiant air warrior helped me to paint a more complete portrait of this remarkable person.

Gennadiy Nikolayevich was on alert duty at that time. The night had passed without incident. The morning promised to be quiet. The clouds, which had been sowing a gentle rain since evening, lifted, but they continued to blanket the sky. The pilots, technicians and mechanics convened on the parking apron: The plan for the day called for flying in adverse weather. Soon after, a fighter took off, and then another. No one was expecting trouble. But it was already beginning to brew.

On the other side of the border, deep within a salient which wedged our southern border northward, two foreign warplanes appeared. They circled there for a long time. A pair of air defense fighters were launched and sent to the border. After a while one of the alien airplanes went back where it had come from, while the other turned west, crossed the USSR state border near the base of the left side of the salient and started penetrating into



our airspace. The pair of fighters could not intercept it—it would have taken too much time to fly around the salient from its right side to its left.

The combat control officer gave orders to Captain G. Yeliseyev, who was the senior pilot of the flight on alert duty:

"Two Four Zero, take off. This is not a drill!"

The regiment chief of staff, who was managing the flying that day, allowed Yeliseyev to take off out of turn. While the MiG-21 climbed, the command post navigator reported the airspace violation to the regiment commander by telephone.

"I'll be right there," Lieutenant Colonel Yu. Murakhovskiy said, and gave orders for the other pilot of the duty flight, Captain V. Spasskiy, to stand by.

Lieutenant Colonel A. Odnolko, the unit's deputy commander for political affairs, left for the command post with the commander. Both went to work immediately, monitoring the process of intercepting the target.

In the meantime Captain Yeliseyev, who had climbed to the required altitude, was flying at maximum speed toward the border. Someone had violated the airspace on this day, 28 November. And he, Yeliseyev, had to cut off this intruder!

Gennadiy was born on 26 December 1937 in Stalingrad to the family of an office worker. His memory of his father was dim: He was only four years old when Nikolay Andreyevich left for the front to defend the motherland against the fascist German invaders. Each day his mother, Varvara Prokofyevna, waited for bits of news from her husband, but the letters came rarely.

The front was drawing closer to Stalingrad. During one of the raids by fascist aviation their house was destroyed. They built a mud hut and moved in. During a lull in the fighting they carried Grandfather, who was paralyzed, outside to breathe the fresh air and regain some strength. His grandsons were playing nearby. Suddenly the artillery barrage resumed. Grandfather was killed by a shell fragment, and Gennadiy's older brother Nikolay was seriously wounded. His head was cut open, and one of his eyes was knocked out. The difficulties Mother had to endure cannot be described. And then there was a funeral in spring '45: Three weeks before the unconditional surrender of fascist Germany, N. A. Yeliseyev, cavalier of the Order of the Patriotic War, 2d Degree, died the death of the brave.

The heroic land of Volgograd.... Each square meter has been copiously irrigated with the blood of the motherland's defenders. Gennadiy grew up in an atmosphere of respect for the valor and courage of the frontline soldiers who blocked the way of the hated enemy on the Volga line. To him, it was a matter of course that he would

become a soldier when he grew up. Aviation was his primary interest. He decided to become a pilot. "In 1953," Gennadiy Nikolayevich wrote in his autobiography, "I joined the Stalingrad aeroclub to learn to be a glider pilot. After finishing the course I received a certificate, in 1954 I was enrolled in pilot school, and in September 1955 I graduated from the aeroclub and was sent to the aviation school in Kacha for further training."

Cadet Yeliseyev studied flying with enormous eagerness. He invariably excelled in his flying. A certain amount of credit for this belongs to his mentor, Lieutenant Colonel G. Balashov, a war veteran and a Hero of the Soviet Union who attentively followed the development of his students. By the end of the second year of training he began to notice that Yeliseyev—one of his best cadets—was becoming less and less satisfied with flying the Yak-11 trainer. The young man could not conceal his dreams of flying jet fighters. But the school in Kacha did not have any jets at that time. Not without Balashov's influence just before the beginning of the third year a group of students including Yeliseyev were transferred to another school in which training was conducted with MiG-17s. Here Gennadiy literally caught his second wind. He flew in ecstasy, with special inspiration: He and his comrades hoped that after graduating from this school they would become the first engineer-pilots.

G. Yeliseyev and other graduates were awarded the officer rank of lieutenant by an order of the USSR minister of defense dated 28 October 1959. Gennadiy was assigned to the Belorussian Military District.

He was one of the first in the regiment to be permitted to fly solo aboard a jet fighter. He began training in interception and aerial combat. And half a year later Lieutenant Yeliseyev was transferred to a neighboring fighter regiment together with some other young pilots. The novices were warmly greeted by squadron commander Major I. Soldatenko. But they were not destined to work together long. Yeliseyev and a few others were transferred to Major L. Belykh's squadron: They were to cross-train to the MiG-21 fighter, which was just being introduced at that time.

Gennadiy dove into the work head-first. It took him just 2 weeks to meet the theory requirements, complete the paired flight training program and begin flying solo in the new fighter.

In fall 1964 Yeliseyev was sent on rotation to the Group of Soviet Forces in Germany, to a Guards fighter regiment possessing glorious combat traditions. According to all who shared their recollections with me about this period of his life, this was precisely where Gennadiy Nikolayevich took final shape as a pilot, an air warrior and a brilliant person of enviable qualities. Relying on the support and assistance of squadron commander Major N. Filin, flight commander Captain R. Nafikov

and other experienced officers, he quickly adapted himself to his new place and worked his way up into the ranks of the regiment's best aviators. Being one of the strongest and best-trained pilots, Yeliseyev often served alert duty. In June 1967 he became a military pilot 1st class, and 2 years later he became a flight commander.

Gennadiy Nikolayevich had actually been prepared for this role a long time previously. He began managing the affairs of the flight confidently and effectively right away, without a breaking-in period, and he soon recommended himself as a competent teacher of pilots. He also proved himself well as a member of the squadron's party bureau. Being of a restless nature, and deeply concerned for the collective's affairs, he made a noticeable contribution to multiplying the military accomplishments of the personnel.

In October 1971 Captain G. Yeliseyev, who had been transferred on rotation to a border military district, was appointed squadron deputy commander. His work here was not the slightest bit easier than in the Group of Soviet Forces in Germany, in direct contact with the aggressive NATO bloc. The same tense flights, the same intensive alert duty. And the situation was similar: Foreign airplanes appeared dangerously close almost every day on the other side of the border.

Yeliseyev's troubles were noticeably compounded. But he possessed sufficient command experience, and he worked harmoniously and cooperatively with squadron commander Major G. Bednov, his deputy commander for political affairs Captain V. Shelestov and squadron engineer Captain A. Sagomonyan. Together they solved the problems of personnel training and indoctrination, and of mobilizing the aviators to attain new successes in military labor.

What assessment was given to his military labor and his attitude toward the work? Here are a few lines out of the last performance report on Gennadiy Nikolayevich: "Trained for day and night flying under minimum weather standards. Flies well. Prepares meticulously, conscientiously for flying.... Learned to fly 11 types and modifications of airplanes in his flying career. Clocked 1,700 hours, to include over 1,000 hours aboard the MiG-21. Serves as a deputy commander in a squadron of proficient combat fliers. Calm, sober-minded, exceptionally diligent and honest. Elected party bureau member several times, served as deputy secretary of the squadron party organization, has been party group organizer for the last 2 years. Morally stable, a good family man. Devotes much attention to bringing up his children—two sons...."

Here in his new place, Gennadiy Nikolayevich often served alert duty, just like before. Several times he made hasty take-offs to intercept practice targets. But this was the first time he was ever launched against a real one. And so he felt even greater responsibility for fulfilling his combat assignment.

The pilot steered his supersonic fighter through the clouds on the shortest route to the area of concern.

"Two Four Zero, set a course of zero eight zero."

"Roger, wilco. What do you have for the target's altitude and speed?"

"Seven. Nine hundred fifty."

Soon another command post which was closest to the border assumed control of the interceptor. Captain V. Temnyy was the flight control navigator on duty here. He was known to be a sufficiently experienced, well trained specialist in the subunit who worked confidently in difficult tactical situations. But this time the captain was noticeably nervous. There was in fact something to be anxious about: Apparently realizing that the violation of Soviet airspace would not go unpunished, the crew of the intruding airplane turned back towards the border and began a retreat.

Responding efficiently to commands from the ground, Yeliseyev swiftly converged with the target. Captain Temnyy led him to the rear hemisphere of the alien airplane. At this moment Yeliseyev's fighter penetrated the clouds and broke into the open sky.

Flooded with bright sunlight, the undulating, broken mass of clouds stretched boundlessly below as a blinding blanket. A little lower in altitude than himself, and to the left and forward, the pilot saw the dark cross shape of a two-seater foreign airplane with a configuration recalling a reconnaissance version of the fighter.

"This is Two Four Zero. Target is on my course and to the left," Yeliseyev reported to the command post, and then added: "I see him 20, now 17 kilometers away."

"That's your target. Force it to a landing."

Each time before assuming alert duty Captain Yeliseyev went over the signals universally accepted in international practice for cases of violation of the USSR state border by a foreign aircraft. After all, the intrusion need not be intentional, it might be accidental as well. Flying nearer to the foreign airplane, he gave the appropriate signal, asking it to proceed to the nearest Soviet airfield. There was no doubt about it: The pilots of the alien airplane not only received the signal but also understood it. But rather than fulfilling his demand, they sharply increased their speed and headed for the border.

Yeliseyev reported the situation to the command post. After all possibilities for forcing the crew of the intruding airplane to heed the demands of the Soviet pilot were exhausted, the flight control navigator gave the command:

"Prepare your weapons. Destroy the target!"

Yeliseyev reported soon after:

"I have lock-on!" At first he could see a whitish trace in the upper half of the sight, and as he turned, it began shifting toward the center. Attempting to evade the blow, the crew of the intruding airplane continued to maneuver energetically, darting from side to side, varying its altitude and banking steeply. The brutal duel began. Here in the sky, in a clash of two wills, of two styles of struggle, the two strong and steadfast opponents entered into combat ready to have it out to the end. The situation grew more complex with every second, and unfortunately it was not evolving in favor of the interceptor. And the border was only a few kilometers away. It was then that the command was transmitted to the fighter:

"Two Four Zero. Ram him!"

And Yeliseyev's reply came across the radio like an echo:

"Roger, wilco!"

Gennadiy Nikolayevich uttered these words calmly, distinctly, as if this was just another training flight. They were documented dispassionately by a tape recorder.

It was fully possible that Yeliseyev was aware that there were still some rounds left in his gun, but at this moment, when the fate of the duel could be decided in an instant and there was no time to reload the weapon and take aim, he felt it impertinent to correct the navigator. He knew that if he was ordered from the ground to ram the aircraft, there was nothing else he could do. From his vantage point above the clouds he could not see where the border was. It could be that it was already quite close. He had to get the intruder, without fail.

The words "Roger, wilco" rang in the flight control navigator's ears. Captain Temnyy glued his eyes to the screen. He could clearly see the two whitish traces merging into one, and then, as their motion stopped, gradually dissolving and disappearing from the screen.

"Two Four Zero, respond! Two Four Zero, respond!"

And in response—only silence....

An investigation revealed that Captain G. Yeliseyev's duel with the intruding airplane lasted only 3 minutes between the moments the target was sighted and rammed. These were minutes of the most intense struggle in the air. The Soviet air warrior displayed valor, courage and heroism. Finding himself in a complex situation, Communist G. Yeliseyev did not flinch before the mortal danger, and as a patriot he opted for a heroic act of self-sacrifice. He was the first in the history of jet aviation to ram another aircraft, annihilating an airplane of an unknown flag that treacherously invaded the USSR.

The officer's heroism was given a high assessment by the motherland. A ukase of the Presidium of the USSR Supreme Soviet awarded Captain Gennadiy Nikolayevich Yeliseyev the Hero of the Soviet Union title (posthumously) for bravery and heroism displayed in the performance of a combat assignment. Ten days later the USSR minister of defense published an order adding the name of the valiant pilot in perpetuity to the personnel roster of the first squadron in fighter aviation—the same one in which he had been serving as a deputy commander.

Time cannot wash Gennadiy Yeliseyev's act of heroism away from the people's memory. The hero remains on duty, he lives in the affairs and thoughts of aviators of a new generation. A corner of the barracks was set up in memory of Hero of the Soviet Union Captain G. Yeliseyev. Each day the roll call at evening inspection begins with his name. A large part of the district's Air Force Museum of Combat Glory and of the unit's room of combat glory is devoted to Yeliseyev's heroism. A bust of Gennadiy Nikolayevich was placed in the regiment's Hall of Fame. Pilots are competing for the right to fly a sortie in Captain Yeliseyev's honor. His flight log book is being maintained. Each year on 28 November the soldiers of his unit celebrate a "Memorial Evening." The name of the courageous pilot is now borne by the air garrison's secondary school and its pioneer organization. His name was also given to one of the streets of Volgograd.

The sons followed in their father's footsteps. Igor, who graduated a few years ago from combined-arms command school, is now serving in the Group of Soviet Forces in Germany, and this year Aleksandr graduated from higher tank command school and was assigned to the Red Banner Odessa Military District. The hero's sons have in a sense taken up the baton of faithfulness to military duty, and they are carrying it further.

Protecting the peaceful skies of the fatherland, Communist Captain G. Yeliseyev committed an act of heroism, inscribing his name forever in the heroic chronicle of the Soviet Armed Forces. His glorious image will inspire new generations of Soviet soldiers to serve the motherland selflessly.

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### **Squadron Describes Ways to Keep Aircraft Maintenance Quality High**

91440065g Moscow AVIATSIYA I KOSMONAVTIKA  
in Russian No 11, Nov 87 pp 28-29

[Article by Capt Yu. Zhukovskiy: "Payment for Carelessness (Discussion of the Article 'The Sky Does Not Forgive Mistakes')"]

[Text] I also found Lieutenant Colonel V. Antyufeyev's article interesting. This experienced squadron commander raises important questions concerned with flying. And first of all he is concerned with finding ways to raise combat readiness and flight safety.

I read the article, and this is what I thought. The author says nothing about what measures of influence should be taken against aviators who violate flying laws and deviate from the requirements of army life. In every collective, after all, besides those who serve honorably and conscientiously, there are also people who find their career a burden. Let me cite a few specific examples to show that I am not just saying this. I think that they will illustrate my thoughts about the responsibility of every aviator for his assigned work better than anything else.

Aviators have many things to think about on the day devoted to preliminary preparation of equipment for flying. The squadron deputy commander for the air force engineer service has many concerns as well. In this particular instance he gave his instructions to his subordinates, and counseled them on what they needed to turn special attention to in the course of their work.

The officer assigned the most important task to specialists of the aviation equipment maintenance group. Their job was to repair a fighter that was down with some malfunctions. Senior Lieutenant A. Nechayev, the group chief, and technician Warrant Officer V. Nikitin worked harmoniously and diligently. They removed the faulty unit, and replaced it with another. The airplane was towed to the gas filling area. A special vehicle drove up, and the mechanic connected the electric cables. The compressor was then started. After the gas bottles were filled, the systems were checked once again. The parameters were normal.

The mood of the specialists of the aviation equipment group remained high on the day of the preflight preparations as well. Aircraft technician Lieutenant V. Matkevich was also pleased. A careful inspection of the fighter, which was scheduled for take-off, showed that the warplane was fully serviceable.

The weather flight was carried out, and preflight instructions were issued. The pilot then took his place in the cockpit of the airplane that had been put back on line the day before. He surveyed the instrument panel and checked the positions of the switches. He tested the engine and persuaded himself that the airplane systems were operating reliably.

The fighter had barely reached its cruising altitude when the alternating current generator light on the cockpit panel turned on. This was an indication of a serious malfunction. But the pilot maintained his self-control, and calmly and clearly reported what happened to the command post of his home base. Instantaneously estimating the situation, the flight control officer transmitted the command:

"Abort your assignment! Return to home base."

The pilot circled in order to stay out of the path of fighters that were still taking off, and landed without incident. Anxious specialists awaited him at the parking

pad. After hearing the crew commander's brief report Senior Lieutenant A. Nechayev immediately began analyzing the causes of the event. He opened the lower hatch. One of the parts, which was in its extreme position, indicated that the voltage aboard the airplane was too high.

Back to the gas filling area, and another meticulous inspection. The instruments showed that everything was in order. But experience and intuition suggested to the group chief that the flaw, which could appear once again, was in the unit that had been installed in place of the faulty one. And so it turned out. They replaced the unit, and together with it, the alternating current generator. The fighter was once again put back on line. Subsequently, all of its systems and machine units operated trouble-free.

And so, the aviation specialists were not to blame for the incident—the faulty unit had let them down. But the engineer, the technicians and the mechanics knew that unforeseen problems in equipment that is basically distinguished by exceptional reliability cannot serve as an excuse. Situations such as the one in which the pilot found himself after take-off must be prevented. And this requires—besides high occupational proficiency—higher alertness, discipline, a sharpened sense of responsibility and self-control.

This was the topic of discussion among the specialists during the technical critique devoted to this defect, which had concealed itself so cunningly in the ill-fated unit. Moreover the specialists were instructed to thoroughly check out the power supply systems of all of the airplanes, which is what they did. It is also noteworthy that the same kind of critiques were conducted in the other groups and flights, in which the corresponding practical measures were implemented. In a word, the subunit responded vigorously to the incident, and made important conclusions from it.

The squadron's active party and Komsomol members took a part in the preventive work as well. In talks with their fellow servicemen they reminded them that strict compliance with flying laws and with the rules of maintaining aviation equipment helps to keep the rhythm of the training smooth and to increase the subunit's combat readiness. They talked about the responsibility of each person for his assigned work. These talks made their imprint. After all, whenever the discussion turns to flight safety and to ensuring trouble-free work of aviation equipment, everyone becomes concerned, because this is not just idle talk. There is deep meaning in what is said. As we have known from life and from aviation practice since long ago, it does not take long for undesirable consequences to appear when someone deviates from the requirements of the regulations in the manuals or when someone fails to complete the work assigned to him. And this has a negative influence upon the accomplishments of the entire collective.

This is why the squadron has created and maintains an atmosphere of intolerance of any violations of the rules and requirements. Communists set the example in this regard. They never ignore negative phenomena and incidents: Their response to them is dictated by their principles.

This is precisely the kind of action that was taken, for example, against pilot Senior Lieutenant N. Morozov, who made a mistake in a flying assignment. A serious, thorough discussion was carried on in the spirit of restructuring at a meeting of the party buro. Friendly advice and recommendations compelled the aviator to think things out, and produced doubtless benefit. Now Senior Lieutenant Morozov performs all elements of exercises planned for him diligently, and complies strictly with flight discipline.

The example of party members in everything associated with principled behavior, irreconcilability and exactingness is followed by active Komsomol members. Using all available forms and methods, they nurture a feeling of personal responsibility for high quality preparation of aviation equipment and armament, discipline and alertness in the soldiers. They organize help for those who need it, and they publicize the experience of the best specialists. And it must be said that the overwhelming majority of Komsomol members carry out their responsibilities irreproachably and make a noticeable contribution to ensuring accident-free flying.

But unfortunately facts of another order are encountered as well. Thus the behavior of Warrant Officer V. Sokolov, who damaged an air system hose when working on a fighter, was analyzed at one of the meetings of the Komsomol committee. This carelessness created a gross problem in use of the airplane. The Komsomol members punished the culprit strictly.

But as subsequent events revealed, the specialist did not make the right conclusions from his lesson. Cases of carelessness repeated themselves. They spoke with Sokolov and appealed to his conscience many times. But even this did not produce the desired results. Then they had to resort to an extreme measure. The Komsomol committee decided to expel V. Sokolov from the Komsomol.

The subunit's command and its party and Komsomol organizations keep constant tabs on the problems of ensuring flight safety and dependable work of aviation equipment. Great significance is attached, besides to preventive work, to popularizing the most sensible procedures of preparing fighters before and during flight shifts and tactical flying exercises. Much is being done to master associated specialties and to publicize the experience of highly skilled specialists.

Recently for example Senior Lieutenant Yu. Makarov's accomplishments in servicing a missile carrier were summarized. The excelling worker himself made a presentation to his fellow servicemen as well. In particular

he described, and demonstrated to the airplane technicians, what needs to be done to prepare a fighter for take-off in response to an alert signal. Other specialists shared their experience as well. All of this doubtlessly had a certain amount of benefit.

The squadron's soldiers try to follow the motto "A high guarantee to technical maintenance" unflinching. And now, in the final period of the training year—the 70th anniversary of Great October, the personnel and the aviation specialists are doing everything dependent upon them in order to ensure flight safety and thus promote a further increase in the subunit's combat readiness.

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**Outstanding Air Transport Commander Profiled**  
*91440065h Moscow AVIATSIYA I KOSMONAVTIKA*  
*in Russian No 11, Nov 87 pp 32-33*

[Article by Col A. Dmitrichenkov: "Detachment Commander"]

[Text] The geography of the careers of military people is quite diverse as a rule. And so it is for air detachment commander Major V. Kustikov as well. He still remembers for example the northern skies— primitively beautiful and deceptively cunning. Snowstorms rage 40-50 days a winter in this stark land. Low-altitude snowstorms and ground winds are only half the problem. High-altitude snowstorms, during which visibility gets especially worse, are by far more dangerous. It is difficult to take off and land airplanes, and sometimes entirely impossible.

"We usually had to fly in adverse weather. There were all kinds of flying assignments. Such were the unique features of our military transport aviation," said Vladimir Anatolyevich. "Sometimes we found ourselves in difficult situations. We had to take risks, especially when deciding what to do in the air became as complex as trying to solve a Rubick's cube. And we had to select the most optimum variant, that which would ensure success. All of this had to be done in a state of the highest psychological stress, in extremely limited time."

Once after completing an assignment Kustikov's crew was returning to base. All were in a happy mood. Then suddenly a high-altitude snowstorm appeared. The situation got critical: Both the main and the back-up airfield were closed by bad weather. What to do? In the words of the crew commander the solution came to him instantaneously—land the airplane at its home base! Kustikov's good flying skills gave him the right to do so.

Kustikov descended into conditions which no one ever exposes himself to without extreme need. He acted boldly and confidently. Driving snow pummeled the crew cabin, and it was very difficult to maintain the glide path, but the commander confidently piloted the craft to a landing.

Finally the wheels touched the runway. Special vehicles rushed to the touchdown point. The crew was surrounded by friends who asked all kinds of questions about how hard it was to control the airplane and how they managed nonetheless to land it in the presence of an extreme side wind and in minimum visibility.

And as they were walking along the taxiway bending almost horizontal into the raging wind, Vladimir Anatolyevich joked:

"If we're not careful this wind will carry us right back up."

He knows how to relieve tension following a time of danger, to turn a situation around with laughter. And the situation in which the crew had found itself, while it was difficult, it was generally typical of northern conditions. Self-control and the ability to act decisively and efficiently had to be maintained at all costs.

By the time Major V. Kustikov was given command of the detachment he had accumulated considerable experience in working with people. The crews which he had commanded were strong, friendly and united. Great credit for this belonged to the commander. Kustikov's labor has been aptly rewarded: The officer was awarded the order "For Service to the Motherland and the USSR Armed Forces," 3d Degree.

Vladimir Anatolyevich makes friends right away, with the first meeting. He is strong of body and level-headed. He has a courageous look about him, and his eyes are clear and kind. But his kindness does not make him an all-forgiving man, and his adherence to principles does not make him an unfeeling hard-heart. Kustikov is highly sensitive to the moods and character of his subordinates, and he knows what to say when things get difficult. This behavior evokes a good response from the people and helps to establish strong spiritual contact with them.

Such was the case for example with senior aircraft technician Senior Lieutenant S. Gubin. The specialist performed his responsibilities well, but he showed no interest in social life. The detachment commander and his fellow workers talked with him about it several times. At first the officer was suspicious and even disbelieving of the attention directed toward him. Later on he came to understand that there were more things in life than personal interests. Captain V. Larinets is now acting as Gubin's mentor. Work with the officer is continuing. And its fruits are already noticeable.

Everyone knows, not only in the detachment but also in the squadron, that Kustikov would not allow anyone to remain at the sidelines of social life. Here is how Major V. Sidorov, the squadron deputy commander for political affairs, feels about him:

"Vladimir Anatolyevich is reliable in all respects. He possesses that rudimentary spiritual quality which we call an active life position. When he sets a goal for himself, it is certain he will reach it. And after reaching it, he goes even farther."

To say that all of Officer Kustikov's work goes on without difficulties would make him out to be some kind of a lucky guy, a person who lives a charmed existence. But this is far from so. He encounters ample situations in his work that cause him special difficulty.

In those days when I was visiting the air base its annual final inspection was just coming to a conclusion. The detachment of military transport airplanes commanded by Major V. Kustikov once again received outstanding scores. In the year of the 70th anniversary of Great October the combat proficiency of the aviators grew with every day, and manifested itself graphically in their specific deeds: They carried out their flights only with good and excellent scores.

The commander's personal assessment of the actions of every pilot, navigator and air force engineer service specialist made everyone work more responsibly for improvement in combat proficiency, organization and order. The laws of flight service have been elevated in the detachment to the rank of state importance not only in words but also in deeds. And all of this is owing to the meticulous preventive work done to prevent flying accidents and near-accidents, carried out among the crews by the squadron command and party organization. Specialists of the air force engineer service and, of course, party organization secretary Captain S. Smirnov are the commander's closest helpers.

Major Kustikov plans every work day. He usually does this the day before. Then he follows his plan thoughtfully, without excessive haste. He makes an effort to arrive at clear and maximally objective assessments of the work. He never embellishes or exaggerates any of the results. He is punctual. In each specific case the discussion ends with conclusions as to what caused the mistakes and what must be done to rectify the situation. Some problems he returns to again and again.

Vladimir Anatolyevich works thoughtfully with novices. For example there was the time when pilot Yu. Staroskolskiy joined the detachment. The commander decided to have the pilot carry out real assignments in the course of his orientation. After all, the sooner an officer works himself in, the more benefit he is to the entire collective. The pilot underwent testing in the trainer in order to pinpoint his mistakes. He received personal help in

analyzing certain problems of aerodynamics and in providing instructions to the crew. Additional training was scheduled for him. Thus the pilot gradually honed his proficiency. Now his flying is first class.

Squadron deputy commander Lieutenant Colonel Yu. Chernyak said that the detachment's aviators were successfully fulfilling their socialist pledges, and were confidently marching along the path of further improvement of combat proficiency. The command has no complaints about Major Kustikov.

"If only all would work as well as he does," emphasized Yuriy Matveyevich. And he added "That man is where he belongs!"

A man where he belongs.... This means that Major Kustikov finds everything in his work interesting. This knack of finding inspiration in his work, which is typical only of purposeful, persistent people, burns within him like a constant flame—not one which shuts off when the work shift is over. And people who work with him cannot help feeling this. The commander leads them to high goals. Such a feeling for life, such an understanding of one's role in it is real human happiness.

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#### **Political Chief Restructures Regiment's Political Work**

91440065i Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 87 pp 38-41

[Article by Maj S. Manyukov: "Arguments of Influence"; first paragraph is AVIATSIYA I KOSMONAVTIKA introduction]

[Text] The June (1987) CPSU Central Committee Plenum emphasized that it is especially important and necessary today to strengthen party influence on all directions of restructuring and to promote competent management of social processes and development of new, creative approaches to party work aimed at raising the combat readiness of the subunits. The progress aviators are making in fulfilling this party directive will be discussed in this series of essays from a fighter-bomber air regiment.

Changeable Carpathian weather prepared a surprise for the pair of aircraft Lieutenant Colonel V. Klinkovskiy was leading to the practice range. The low cloud cover completely "plugged" all approaches to the objective of the strike. Nonetheless the aircraft made a flawless target approach. Diving from out of the clouds, they hit the target with lethal blows, and in the next instant they dissolved into the milky film.

The pair was still in the air when the report came in from the training ground: perfect marksmanship, an outstanding score.

There was no question that their performance deserved a flash bulletin bearing congratulations. "If anyone else were to do as well at the training ground under these conditions," thought Captain M. Variy, the regiment's deputy chief for political affairs, "he would have been rewarded with a flashy congratulatory certificate in a minute. But when it comes to Klinkovskiy, the chief of the regiment's political department, such a spontaneous show of congratulations would not be approved. After all, if he were a less experienced pilot, this would have been a shining success, but for the regiment's political worker this is only the norm. And this means that loud praise would be inappropriate."

The lieutenant colonel descended down the ladder casually to the concrete, and removed his helmet. A wind gust blew scattered raindrops, chilling his ruddy face. But Klinkovskiy did not turn away. Peering intently at the distant horizon, he awaited the return of those who were still in the air. They were sure to have a more difficult time of it than he did.

He was distracted from his thoughts by a well-built lanky form approaching him on the asphalt path. He recognized his deputy from his light, springy step. He smiled: "He just can't sit still, can he?" Miron Variy's confident, quick strides were an outward manifestation of his indefatigable temperament, his fighting character. And so he was in his work—assertive, composed, fast-working.

The chief of the political department and his deputy are astoundingly different from one another. In age, in life experience, and in character. The large, athletically-built, casual, determined lieutenant colonel wisened by decades of service, and the short impetuous captain. One had a record of solid experience as a political worker and an air warrior, while the other was an engineer, a Komsomol worker, a ground-pounder as they say. Nonetheless they organically supplement one another, inasmuch as experience in life and in the army and the eagerness of youth are alloyed into one with real interest in the work. It was this main characteristic—the core of the personality—that brought together such outwardly different people.

Shaking hands, they briefly exchanged information on their most urgent political concerns. Ones having to do not with office work but with things that were going on at the airfield. The deputy had already managed to visit the command dispatching point and the technical maintenance unit, talk with the Komsomol members and check out the parking aprons. He spoke knowledgeably about the mood of the people and the work of active Komsomol members. It was evident that he knew what he had to do: He managed to check out those elements of the complex regimental organism to which the chief had

devoted less attention that day because of his flying schedule. And although the flight shift was successful on the whole, there were some things the two political workers had to think about together.

There were still many sore spots in the collective. Not everyone was identically perceiving the political department's line toward fundamental restructuring of the work—a line which had been met with understanding and support from the regiment command. Klinkovskiy and Varyi were persuaded on several occasions that the restructuring effort tests the spiritual strength of each aviator every day, every hour. They still remember those recent times when the political workers had to tax themselves, to search hard for ways to surmount obsolete stereotypes of thinking and acting.

Things turned out in such a way that almost all of the people in the regiment's political department rotated out within a short period of time. The complexity of the tasks and the intense plan of combat training did not leave any time for gradual orientation. In those days Lieutenant Colonel Klinkovskiy was "flying on instruments": The slightest mistake, and his goal would be past him. To organize political work he had to work extremely precisely, to take a calculating, thoroughly tested navigator's approach to the effort. He clearly defined the course to be taken by the political department: to eliminate the red tape of paperwork and committee meetings, and to devote maximum time to real work with people right in the subunits and the primary party organizations. And not to just inspect but to provide specific assistance to the active members, to participate personally in organizing the work. And chiefly at the airfield—in the place where combat readiness is forged.

He assumed personal responsibility over the most important thing—political indoctrination of flying active party members and squadron political workers. Lieutenant Colonel Klinkovskiy's style, his methods of influence and his approach to people are characterized by the following point. No one in the regiment can recall a single day that the chief of the political department has shut himself away from everything in his office. His usual work station is the party-political work classroom in the training building. Used by all political workers and active members, the classroom is set up for work. The displays are free of cosmetic trappings. There is no gingerbread made from expensive wood, no flashiness. There is something else attractive about these displays—the concreteness and depth of the content of the visual agitation materials.

The training process is well organized here as well. Deputy commanders for political affairs begin their preparations for the flying day here in the classroom. The planning, the places to which active workers are assigned, the instructions given to each of them—all of these things are thought out down to the smallest details. And when they talk, they concern themselves not at all

with lists of measures or with filling squares in the plans, but rather with specific people, with their thoughts, concerns and their attitude toward the work.

"You can't put it all down on paper, Oleg Ivanovich," Klinkovskiy once noted in a discussion with squadron deputy commander for political affairs Major O. Zaytsev. "A plan is only a general road map, just to keep from getting lost. And the specific things we do as political workers must be updated daily."

It became clear to Zaytsev: The first few words are only a means to initiate substantial discussion. And so it happened.

"What about tomorrow's flying shift, what kind of difficulties do you foresee?" the lieutenant colonel asked.

The squadron deputy commander shrugged his shoulders. The day was going to be ordinary, like many others, he said.

"But it seems to me there are grounds for concern. What kind of mood are the young pilots going to be in when the flying begins? Some factors, after all, that may bring about flying accidents have already been discovered. Have you analyzed the causes?"

"We discussed them at a meeting, like we're supposed to. And we talked with each person individually, in all seriousness."

"So you've identified those to blame. But did anything good come of it? Were you able to reveal the causes?"

"What do you mean, special causes? They were chance mistakes brought on by the carelessness of youth. We do, after all, organize everything carefully—the preflight preparations, the training exercises."

"By the way, did you visit the home of the person responsible for the latest mistake?"

"Just last week. Together with the squadron commander. His living conditions are excellent, so that he has nothing to complain about," the deputy commander for political affairs said confidently.

"That means you didn't pay any attention to his wife," the chief of the political department summarized. "She's expecting, you know.... That means when he flies, his mind is still at home. What if something should happen, who would get transportation to get her to the hospital? Remember what it was like for you...."

Zaytsev could do nothing but smile sheepishly:

"We didn't think of that.... We'll take care of it."



What he did not know was that Klinkovskiy had already thought of everything and took care of things. He had met with active members of the women's council and asked that the young expectant mother be put under someone's care, so that she would not feel forgotten and alone when her husband was at work.

"The human factor is the main one. It requires a great deal from each of us. And a sense of humanity as well. I think that we will find time tomorrow to talk to the younger men about this without lecturing them. And about safety violations without shouting," Klinkovskiy concluded.

That is the way he organizes his own work, and that is the approach he also demands of his subordinates. In the beginning, while the political workers were still getting used to the situation, he steered their work with weekly and sometimes even daily assignments. There were many difficulties. For example that same Variy, despite his tendency to work hard, somehow could not avoid dealing with generalities.

"Do things more simply, more specifically," Klinkovskiy recommended to him. "Study the individual features of the people."

And then they discussed the finest details of the next day's schedule on the spot.

The chief of the political department did understand that this was a forced measure, a temporary one: If a political worker transforms just into an executor, an administrator, you could not expect any serious innovations from him. This is why one day he posed the question directly:

"We have been talking a great deal about restructuring, but what are we actually doing to restructure our own work?"

"So far all we've done is offer recommendations," Captain Variy sighed unhappily. "We keep telling everyone to begin with themselves. But when it comes to personal evaluations, things are still moving at a snail's pace. That means we're just talking to the wind, rather than acting!"

"So there you are," Klinkovskiy said, shaking his troubled head. "That's going a little too far! You've only been in the unit for a short time, but you think you know everything already. You've learned all of the fashionable things to say. And I know what's going to come next—citing facts and naming names, labeling the culprits."

Some time earlier, when he learned that a senior instructor from the Komsomol work division of the political department of the district air forces was being considered as his deputy, doubts flashed through his mind: Were they going to send the regiment a shallow thinker

who feels that that his only job is to document shortcomings? Before expressing his own thoughts, Klinkovskiy decided to take his time, and hear out what the captain was getting at.

"Who are the culprits?" Variy replied after a thoughtful silence. "The deputy commander, of course, is at the top," he said of himself in third person. "I gave my recommendations, and I sat there hoping that they would all be carried out right away, but I never did follow through. The meetings are still being conducted in the old ways in some places. And have we gotten very far at all with the personal evaluation program?"

Yes, the question was not an idle one, and perhaps at this time it was one of the most important—ensuring that communists play a vanguard role and set the personal example. One would think that the political department had done everything necessary: The party documents and the directives from higher political organs were thoroughly discussed together with the political workers and active party members, their own recommendations had been circulated and their receipt had been acknowledged with signatures, and the political workers themselves spoke at the party meetings with the purpose of persuading, suggesting and appealing. Was this enough? According to today's yardsticks, no. What is most important, after all, is not the quantity of measures but the end result.

"I don't think that whipping ourselves about it is going to do any good. We're all guilty of shortcomings. That means that we need to all work together to turn things around. Do you have any suggestions?" Klinkovskiy asked.

This was just the opportunity Captain Variy had been waiting for.

"Not everyone has yet grasped the essence of our ideas. That's why things are not getting off the ground. We need to do some work in the squadrons, in the primary party organizations. And to act on the advice of the party secretaries, and listen to their points of view."

The deputy was right. And so the political department recommended a number of new forms of work to the primary party organizations. For example, leaving the party report off the agendas of some of the meetings; announcing the draft resolutions not at the end but at the beginning of the discussion. Now the practice of briefly speaking and suggesting proposals from the floor, rather than making long speeches from the podium, is taking root. The communists quickly grasped that the innovations were not going to be just skin deep. After all, when it comes to certain urgent problems, making speeches about things everyone knows about already is like beating a dead horse. What was needed was maximum

concreteness and free exchange of opinions. Klinkovskiy was pleased that positive changes were being made in this direction. But progress with personal evaluations was still slow.

Personal evaluations are not to everyone's liking. On some occasions the issue even produced conflicts. The chief of the political department still remembered the collision of opinions that occurred when it was suggested that Lieutenant Colonel N. Breymurov, the unit deputy commander for the air force engineer service, should make his report not to the buro but to a meeting of the directorate's primary party organization. Respected friends of Klinkovskiy's expressed apprehensions about the idea: There would be no benefit to airing the actions of such a high-placed leader in public, they said, since this would undermine his authority. And so Lieutenant Colonel Klinkovskiy was forced to defend the position taken by the political department and the primary party organization. He succeeded in the end, and a principled and open discussion of the communist leader's personal qualities was conducted. He helped Breymurov regain the right path in his behavior, and to improve his mutual relationships with subordinates. And the response from the collective was overwhelming: Full glasnost, practiced without reservations, demonstrated its power and effectiveness.

This was not an exceptional case. The number of accountability reports given by communist executives, political workers, party secretaries and Komsomol leaders to the political department and to the primary party organizations grew noticeably, and this became a daily practice. Moreover the objectives of the reports were stated clearly: revealing mistakes in a particular area of work, analyzing new ideas, and generalizing the best experience.

But this is only one side of the problem. There is another, no less important side—monthly personal evaluation of the work of all communists at party meetings, without exception. This was a tougher nut to crack.

Although it seemed as if everyone understood the political department's recommendations, Officer V. Zabolotnyy, secretary of the directorate's party organization buro, stubbornly avoided raising this issue from the party podium. No other reaction could have been expected, considering that he had said the following for all to hear in one of the meetings: "As far as restructuring is concerned, I personally restructured myself long ago." This was despite the fact that the directorate's party organization was still sitting on many personal petitions and adopted resolutions which it had not yet acted on.

Thus it was no accident that in his talk with the chief of the political department Varyi mentioned the displays of monthly evaluations of the personal example set by communists in service and in social work. The goal was clear—attaining full glasnost. But how was this goal to be embodied in concrete form?

The first attempts at creating such displays turned out to be extremely overcomplicated—all kinds of notes and little multicolored diamonds, squares and circles. The final products ended up more like puzzles than displays. Consequently the benefit from them was low. After discussing the problem, they decided to change the form in which the material was presented.

Now the range of activities on the basis of which each communist is evaluated includes fulfillment of permanent duties in elective organs, and participation in the work of the party and Komsomol organizations. The communist's political indoctrination, agitation and propaganda, and cultural and educational work are illuminated separately. Discipline, diligence, actions creating the possibility of flying accidents, and the quality of flight support are accounted for. And to keep the display simple and visually comprehensible, areas in which the individual is active are marked in red, and those in which he is passive are marked in blue. You could tell at a glance what side of the fence the individual is on in regard to general concerns, and how he perceives restructuring—whether he is taking a wait-and-see attitude, or acting.

One day when the political workers were discussing their work plan, Lieutenant Colonel Klinkovskiy spoke with some concern:

"Changes are being made in party work. But the Komsomol is still a problem." And, turning to Senior Lieutenant V. Shabarshov, his assistant for Komsomol work, he asked: "Why can't they get things off the ground?"

"What do you mean?" Shabarshov objected strongly. "We've introduced personal work evaluations, we're now conducting meetings in the new way—we're borrowing every idea we can."

"But could it be that you are just simply copying the ideas?" Varyi asked.

"Well, maybe some of them, but we have come up with some ideas of our own. Take for example 1st Squadron's initiative. And what about our meetings with war veterans?"

The Komsomol leader's objections were valid in general. The initiative "A Komsomol guarantee of quality for every sortie" was a useful proposition. And the meetings with war veterans were producing a tangible impact. Nonetheless, Klinkovskiy could not keep from remarking:

"Finding a new idea is only half the battle. What is important to us is not the way things are done, but the final result. Let's sit down and think about what this final result should be, and what sort of help the Komsomol might need."

They got right down to it: They planned the work active party and Komsomol members were to do at the air base. Working with specialists of the testing group they drafted honor certificates named in memory of heroes of the Soviet Union A. Bashta and A. Valeyev, veterans of their unit, and they organized publication of information bulletins titled "Information Exchange with the War Days."

"One other thing comes to mind," Major A. Nafikov, the political department's propagandist noted one day. "Young technicians will soon be certified for independent work. That will be a real test of our Komsomol guarantee."

"We have had experience in these matters before," Lieutenant Colonel Klinkovskiy said in support of his proposal. "Recently the lieutenants were certified for their first solo flight. We need to make the same kind of important occasion out of the day the technicians are certified."

Klinkovskiy, Shabarshov and Variy made an effort to see that the experience of 1st Squadron's Komsomol committee, which was headed by Senior Lieutenant V. Kashikov, would be brought to everyone's attention.

On the regiment's anniversary they got together and held a solemn meeting. Every young technician was personally congratulated and presented with a memorial certificate bearing the best wishes of his comrades.

There was good reason why the aviators were in a holiday mood: The regiment was proclaimed the leader of the socialist competition among Carpathian aviators on the basis of the results of the previous training period. The commander and the chief of the political department brought this news to the regiment on the eve of its holiday from a meeting of the Military Council of the district air forces. The Order of the Red Star was presented to Lieutenant Colonel V. Klinkovskiy at this meeting.

Some time later it was announced that the chief of the political department was invited to present an accountability report to the political department of the district's air forces. One would have thought that the report would be clear sailing, since the regiment had fulfilled its pledges, personnel had received high scores, the number of disciplinary violations had decreased by a time and a half, and flying time had increased by 18 percent. Also, the inspectors took notice of the many new ideas introduced in party political work. But Klinkovskiy himself evaluated the work of the political department on the basis of other, more rigid standards. He did not even feel it was pertinent to mention the successes in his report. When the floor was turned over to him, he outlined the areas to which the regiment's political workers had to apply themselves, and he announced their shortcomings honestly and openly.

"There still are things that are holding us back, and it's hard to get rid of them," he said, and he began talking about the difficulties in restructuring the thinking of people, and about the barriers to new ideas.

He spoke frankly, and perhaps even too categorically. But he did so because he was certain that the fresh winds of change in the regiment had to grow stronger, to gain force.

At the time that this issue was being prepared for publication, the editor's office received news that Lieutenant Colonel V. Klinkovskiy had been appointed to a higher position.

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### SDI Faces Insurmountable Obstacles

91440065j Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 11, Nov 87 pp 42-43

[Article by Col M. Sergeyev and Col (Res) O. Frantsev based on foreign publications: "SDI: Reality and Myths"]

[Text] Announcing initiation of the development of a global antiballistic missile defense system, on 23 March 1983 the American president declared that SDI would supposedly help mankind "rise above the maintenance of relations with other countries...based on a threat to their survival," and that for the first time, people will be able to "live peacefully," because nuclear weapons would be made "powerless and obsolete." In short, fit only for the scrap heap. Today it is clear to most people who and what Reagan had in mind when he uttered these words. In a world in which America's SDI would reign, only the USA would be able to "live peacefully," and what was to be made "powerless and obsolete" was the nuclear missile weapons of the USSR. This is stated directly and openly in an interim position paper of the Strategic Defense Initiative Organization created recently in the USA: "The end goal of SDI is to neutralize the threat of attack by nuclear ballistic missiles" (Soviet missiles are implied.—Author).

How far have the ideologists and developers of the global antiballistic missile defense system in the USA progressed toward their desired goal?

Weapons research and development is concentrated in two basic directions—directed energy weapons (laser, beam, electromagnetic radiation) and kinetic energy weapons. In June of this year the journal AVIATSIYA I KOSMONAVTIKA acquainted readers with the details of the layout and use of nuclear-pumped X-ray lasers and electromagnetic radiation weapons. Therefore we will begin our discussion of directed energy weapons with the hydrogen fluoride chemical laser, which uses the chemical reaction between fluorine and hydrogen as its energy

source. It produces infrared radiation in the wavelength range from 2.6 to 3 microns. The reaction proceeds in a resonator through which the working gas mixture is pumped at supersonic speed.

Analyzing the progress the USA is making in developing chemical lasers, specialists point to a number of shortcomings and difficulties that introduce uncertainty into the evaluation of the effectiveness of using these lasers for SDI purposes. Thus the emission power required of laser space stations must be almost three orders of magnitude greater than what has been achieved thus far—a few hundred megawatts, as compared to the two megawatts that have been achieved in ground tests on the Alpha chemical laser. The size and weight characteristics of chemical lasers are still impermissibly high, making their delivery into orbit problematic: The weight of one station equipped with the required reserve of laser fuel would attain several thousand tons.

It is predicted that interference to operation of a chemical laser space station may arise owing to formation and accumulation of a cloud of spent gas mixture around it; the surrounding gas could absorb radiation and thus "blind" the tracking and aiming systems. Also in doubt is the possibility of maintaining the stability of the station's position in the face of vibrations, movements and rotation caused by the jet thrust of gas mixture moving at supersonic speed at the moment the system is "fired."

These shortcomings could be avoided by basing a chemical hydrogen fluoride laser on the ground. But this possibility is excluded because radiation from an HF laser would be completely absorbed by the troposphere. American specialists are trying to solve this problem by creating a deuterium fluoride laser—a DF laser. Its emissions, which fall within the 3.6-4 micron wavelength interval, pass through the atmosphere practically without losses. Consequently it can hit targets both from space and from earth. The size and weight characteristics of a laser of this type are similar to those of a hydrogen fluoride laser.

Excimeric lasers use some chemical compounds of inert gases as the active agent—for example chloride and fluoride compounds of argon, krypton, and xenon in unstable, excited state. Gas mixtures may be excited to such a state by heating them with external sources—a beam of electrons from an electric discharge, neutrons from a nuclear reactor, or by the pumping effect of a nuclear burst.

The excimeric laser is unique in that after the system is "fired," the gas mixture remains in a highly heated state for a certain period of time, and it cannot be reused until it cools. This is one of the main things which will preclude placement of excimeric lasers aboard military space stations, because to ensure a rapid rate of fire, such

a station would have to be equipped with several lasers that are then turned on (and correspondingly allowed to cool) in succession. This would sharply increase the size and weight of the station.

The need for having a high energy device to pump the laser—a nuclear reactor for example—aboard the station would also increase its weight unacceptably. This is why SDI's developers are showing preference for basing excimeric lasers on the ground and aiming them at objects in space by means of a system of space-based reflecting mirrors.

Scientific research on free electron lasers has recently enjoyed significant development in the USA. As with excimeric lasers, these are "ground-space" lasers. They are based on a linear electron accelerator. When a beam of electrons passes through a special device possessing a magnetic system—a so-called wiggler, the electrons begin to oscillate in a direction perpendicular to the orientation of the beam, releasing energy in the form of photons. Thus coherent laser radiation arises.

Owing to the possibility for varying the energy of the electrons, the range of a free electron laser's operating wavelengths may be very wide—from the infrared to the X-ray spectrum. But acquisition of radiation in the near infrared spectrum (with a wavelength of around 1 micron), which is believed to be optimum for antiballistic missile defense uses from the standpoint of the ray's passage through the atmosphere, would require an electron beam with an energy of several hundred Mev. According to estimates made by American specialists such power would theoretically be attainable within the next few years, and therefore the free electron laser is viewed as the prime candidate for a directed energy weapon system by which to destroy missiles in the active and middle portions of their trajectory.

The journal AVIATION WEEK AND SPACE TECHNOLOGY reports that there are plans for building an experimental free electron laser device at the White Sands Proving Ground for experiments on destroying ground and air targets, high-altitude rockets and orbiting satellites. The device will include an electron accelerator 730 m long with a maximum beam energy of up to 300 Mev, a 200-meter wiggler and a large adaptive optical system by which to aim the laser ray. Foreign military specialists are despondent over the enormous size and weight of the laser device.

In its operational variant the free electron laser weapon system must include around 25 geographically separated ground laser positions and large space-based mirrors to reflect the rays to the targets. According to a report by Fletcher's commission published in the USA, the brightness of radiation that has been achieved thus far from all types of lasers is still millions of times weaker than required for an effective weapon.

Use of beam weapons is based on the ability of beams of high energy particles to evoke radiation damage to semiconductor electronics and even thermal destruction of certain structural components of the irradiated target—a missile warhead for example. Beams of neutral particles (hydrogen or deuterium atoms) are presently preferred for space-based beam weapons, since such beams would not be deflected in space by the geomagnetic field or spread as a result of electrostatic repulsion of like charged particles. According to calculations made by specialists of the laboratory in Los Alamos, where the principal research on beam weapons is concentrated, use of such weapons would be effective at altitudes of not less than 200-250 km (that is, in a vacuum), and that the kill radius would be around 1,000 km.

Destruction of missiles and separated warheads in the active and middle portions of their trajectory is believed to be the most probable means of combat use of beam weapons. In this case inasmuch as the particle flux is practically unlimited and the beam need not be locked onto the target for a long time, such a weapon can be used to destroy group targets by means of rapid re-aiming of the beam.

The main problem in creating space-based beam weapons is believed to be creation of light, compact accelerators and highly efficient energy sources. It is pointed out in particular that the SP-100 space-based nuclear reactor device presently under development, which would generate a power of several hundred kilowatts, will not satisfy the needs of such a weapon.

Use of beam weapons for early target selection was recently proposed as a first practical step toward creating such weapons. It is believed in this case that the prospects for target selection are better than with radar or infrared sensors. For example it is pointed out that a radar station would perceive a camouflaged warhead in an inflatable metal-lined sheath as a decoy. But when such an object is irradiated by a neutral particle beam, the warhead can be detected. In order to carry out field experiments in target selection, the U.S. Air Force plans to launch a neutral particle beam accelerator, a target satellite and a satellite carrying recording apparatus into space in the early 1990s. The weight of the accelerator would be around 20 tons, and its length would be 30-36 m. The reusable Space Shuttle will be used to insert the accelerator into orbit.

Kinetic energy weapons are represented mainly by interceptor missiles equipped with chemical propellant engines and a homing system. They are to be used both from space platforms against missiles in the active portion of their trajectory, and from earth to intercept warheads in the terminal flight phase. The cost of this program is enormous, and the effectiveness of destroying warheads in their terminal flight phase is 16 percent. Such are the conclusions of the specialists.

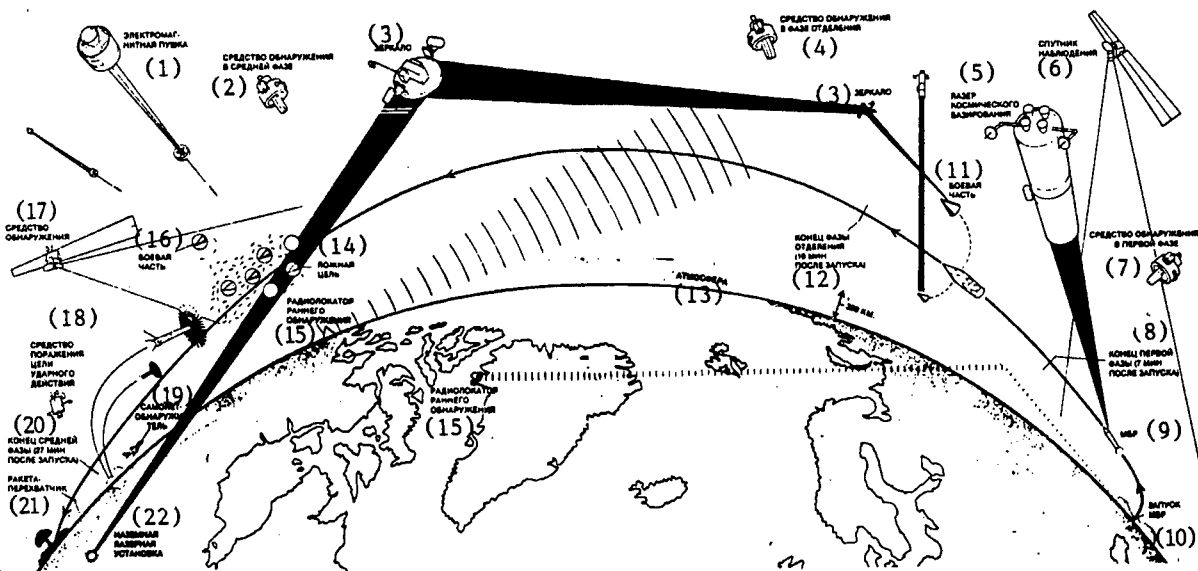
Use of rapid-fire space-based electromagnetic cannons in addition to directed energy weapon systems is proposed as a means of destroying warheads in the middle (ballistic) flight phase, when the quantity of targets would grow by at least an order of magnitude as a result of separation. The idea of an electromagnetic cannon entails utilizing an electromagnetic system in which the pressure of a traveling magnetic field accelerates a projectile moving along guide rails to hypersonic speeds on the order of 10-20 km/sec. Plastic ballistic projectiles may be used as the accelerated destructive elements.

Experiments on electromagnetic weapon systems are presently focused mainly on achieving high projectile velocities and initial accelerations. It is reported in the foreign press that velocities of around 4-4.5 km/sec have been attained for projectiles weighing 100 grams using ground-based electrodynamic mass accelerators—prototypes of weapon systems.

But the problem of creating a military electromagnetic cannon is not limited solely to attaining high projectile velocity. Questions as to the possibility of significantly reducing the linear dimensions of electromagnetic accelerators (which are now several hundred meters), and as to the improbably high weight of the power systems of these accelerators, which may attain several hundred tons, remain open. Work on the complex problems of ensuring firing accuracy and re-aiming a space-based electromagnetic cannon is in the purely theoretical stage.

Information in the foreign press and evaluations by foreign—including American—specialists show that the difficulties in the way of creating a large antiballistic missile system employing space-based components are significantly greater than had been supposed. As was noted in one of the SDI reports to the U.S. Senate, despite certain scientific and technical successes scientists have not been able to make radical achievements ("breakthroughs") hoped for by the SDI program administration even in relation to the key component of a future antiballistic missile system—in relation to the problem of developing the destructive resources. Moreover an enormous quantity of other doubtful and unknown factors have been revealed, and they will continue to be unknown even after the antiballistic missile defense system is deployed, inasmuch as adequate tests of some components—chiefly ones such as X-ray lasers—are impossible in real conditions.

As experience accumulates and as deeper evaluations are made of all of the problems of SDI, experts in many countries are coming to the conclusion that the main difficulties of creating a large-scale antiballistic missile system will be associated not so much with developing the operational components of the system—the destructive resources—as with ensuring the operation of these components in combat conditions and the effectiveness of the system as a whole. Judging from statements and evaluations published in the press, the ideologists and developers of the antiballistic missile defense system are



Deployment of an Antiballistic Missile Defense System Disposed in Depth

Key:

1. Electromagnetic cannon
2. Middle phase detector
3. Mirror
4. Separation phase detector
5. Space-based laser
6. Surveillance satellite
7. First phase detector
8. End of first phase (7 minutes after launch)
9. ICBM
10. Launching of ICBM
11. Warhead
12. End of separation phase (10 minutes after launch)
13. Atmosphere
14. Decoy
15. Early warning radar
16. Warhead
17. Detector
18. Impact-action target destruction resource
19. Detecting airplane
20. End of middle phase (27 minutes after launch)
21. Intercepting missile
22. Ground-based laser device

apparently even more concerned by the problems of ensuring the survivability of the system and its individual components, inasmuch as an increasingly larger number of specialists, with even American specialists among them, feel that this is unattainable.

Thus most scientists, politicians and military specialists in the USA agree that a deeply disposed global antiballistic missile defense system containing space-based components is a utopian idea, an impossible "dream" of the president, and that the system will never be created in the form in which the president imagines it. Many specialists are certain that this will be a "Maginot Line"

in space, one which the Russians will not try to penetrate. Instead they would easily get around it, for example by launching large numbers of cruise missiles, which the system being developed in the USA would not be able to stop. Consequently the president's hope of making nuclear weapons "powerless and obsolete" is meaningless. Space weapons could only destabilize the strategic situation in the world, and lead to a new spiral in the arms race.

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## **Soviet-Syrian Crews Prepare for Flight to Mir Space Station**

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[Articles by G. Glabay and D. Churkin: "USSR-Syria: Flight to the Mir Complex"; continued from No 10]

[Text]

### **"Crew Training," by G. Glabay**

Actual training of the formed crews began in January 1987. The crews were formed, but they were not yet integral units. In the beginning these were simply two groups of people brought together for a common task. An atmosphere of benevolence and mutual respect established itself in the course of joint work. The cosmonauts acquired a high sense of responsibility for the common effort, and they were always ready to come to each other's assistance. And credit for the fact that the crews did become integral units belongs without a doubt to their commanders—A. Viktorenko and A. Solovyev.

Success of a space expedition would be unimaginable to cosmonauts unless they meticulously practiced their actions while still on earth until they became automatic. They were aided in this effort by instructor trainers, instructors and all who prepared and supported the flight. Each made his contribution to the common effort.

For example instructors A. Manyukhin and I. Sokhin were responsible for the flight program of the transport craft. They worked for many months with the crews, and together with them they went through the final rehearsals with the integrated trainer. They accompanied them to the cosmodrome, right up to the doors of the elevator at the launching pad. They monitored the actions of the cosmonauts in the spacecraft cabin, and if there was a need, they helped them with advice. Then after the crew returned to earth, they wrote up the report together. Trainer specialists B. Yeltsev, V. Boyarchik and V. Osokin helped the cosmonauts hone their docking, undocking and landing skills, and to practice all of the main flight phases.

I was availed an opportunity to attend a training session in which A. Belozarov, an experienced specialist, worked with the commander of the main crew on the safety measures associated with manual approach and docking. Competent commanders with a good sense of space approach the docking unit by the shortest path. And that is what A. Viktorenko did.

The call sign selected for the main crew was "Vityaz." This early Russian word is defined as brave warrior, or hero. Mukhammed Akhmed Faris was surprised and pleased by this choice of call signs: The Syrian word for vityaz is faris. We should note that a call sign is usually given to a commander at the time of his first flight. After that, no matter how many times he flies, this call sign

remains his own. The call sign is given to the other crew members only for the time of the flight, such that the flight engineer and researcher receive a new call sign each time.

Integrated training of the main and back-up crews was planned for 4 and 5 July. This was the final test of the work of the cosmonauts and Flight Control Center specialists. The day before, the crews appeared before the medical commission and underwent a battery of around 40 examinations. And now, in the integrated training exercise, the cosmonauts had to live through a condensed version of the seven-day flight program including all of the flight's main phases.

The crew occupied its places in the spacecraft cabin. The work of programming in the initial conditions, testing airtightness and radio communications, and so on began. Routine and unusual situations were introduced from a console. The correctness of the actions of the crew and their reactions to different flight phases were recorded. Anxiety was greatest among the instructors, since in such a case, as I. Sokhin noted, they know what is going on, and they can see the entire situation, but they are not entitled to offer any hints, while in the meantime the dynamics of the training exercise grow more complex.

Following the exercise an expert commission presented its conclusion: Both crews were completely ready for the flight.

On to Baykonur.

### **"Nine Days Before Launching," by D. Churkin**

Two airplanes carrying the cosmonaut crews, instructors from the Cosmonaut Training Center imeni Yu. A. Gagarin and medical personnel took off from a suburban Moscow airfield on 13 July. Moscow gave them a rainy send-off, and the steppes of Kazakhstan, which are usually sun-scorched in July, met them this time with a yellow-green carpet. It was raining intermittently in Baykonur as well.

The buses made their way to the hotel through the streets of Leninsk—the city of the space pioneers. A banner bearing words of welcome in Russian and Arabian was hung over the entrance to Kosmonavt Hotel. And below it, on the door itself, there was a sign: "Notice. Medical control. Unauthorized entry prohibited." From this day forth, medical personnel strictly monitored the health of not only the cosmonauts themselves but also of all who came into contact with them.

On that same day the crews began their prelaunch preparations. First they tried on their flight gear and inspected the work stations of the Soyuz TM-3 transport craft. The cosmonauts donned their pressure suits and made sure that they were airtight. Taking their places in the spacecraft they checked the radio communication

system, passed on the convenience of the fixtures in the descent vehicle and the crew compartment, and acquainted themselves with the cargo to be placed into orbit by the transport craft.

In the morning of the following day medical personnel conducted a final lesson for them in the use of the onboard medical kit for self- and mutual aid, and once again reminded them of the diseases unique to space flight conditions: fatigue, nervous disorders elicited by stressful situations, eye injuries by ultraviolet radiation, foreign bodies in the eyes, and vestibular disorders especially typical of the period of adaptation to weightlessness.

Then the specialists recalled to the cosmonauts the procedures and features of the scientific experiments.

Following consultation with the cosmonauts, the latter practiced with a special manual rendezvous and approach trainer. According to the flight program of the Soyuz TM-3 transport craft, in a routine rendezvous situation the cosmonauts monitor the work of automatic onboard systems, and if the onboard computer complex or the "Kurs" radiotechnical rendezvous system fails, they must be ready to assume control, and approach and dock with the Mir station manually. During the pre-launch preparation period they worked with this trainer daily to maintain their acquired habits of manual control of the transport craft.

The cosmonauts eagerly participated in the physical training they had begun in their compound in Zvezdnyy. But in the prelaunch period they selected exercises that raised the body's resistance to the unfavorable factors of space flight. These primarily included various rotation, tilting and turning exercises that strengthen the vestibular apparatus. On an orthopedic table, for example, the person's legs are higher than his head, which causes blood to flow to the head—a phenomenon typical of weightlessness. And in the evenings, to relieve tiredness accumulated over the day, the cosmonauts underwent water massage.

On 15 July the work day began with briefings on the life support systems. Specialists described features of maintaining the Mir station and the Kvant scientific module, and the plan of preventive maintenance, repairs and tests of equipment during the expedition's visit.

A significant part of the time was also devoted to work with space navigation and star charts. These charts show the positions of the stars and planets for a period of 10 days—that is, the entire time of work of the Soviet-Syrian crew. The space navigation charts can be used to determine the position of the satellite relative to earth in the event that the onboard navigational globe fails, which is especially important for the return trip to earth.

On the following day the crews underwent a thorough clinical physiological examination. Recording a daily electrocardiogram was an important component of this examination. This electrocardiogram makes it possible to assess the state of the cardiovascular system's regulatory centers. While aboard the Mir complex, the members of the Soviet-Syrian crew were to conduct a medical study titled "Kardiografiya [Cardiography]," the purpose of which was to monitor the state of cardiac activity in different phases of the flight. This is why after the clinical physiological examination was completed specialists on the medical experiments used equipment identical to the onboard scientific apparatus to brief the cosmonauts on the most important studies to be carried out aboard the Mir complex.

Then the cosmonauts rehearsed interaction with the cosmodrome's launching service, with the command and control complex and with Flight Control Center in the orbital insertion phase of the Soyuz TM-3 transport craft. This rehearsal revealed the readiness of all services for launching.

The doctors prohibited members of the Soviet-Syrian crew from playing tennis as of 17 July: Even the slightest injury would now be impermissible. To maintain their physical shape they were allowed to run and to perform exercises.

Together with their instructors, after their physical exercise the cosmonauts once again examined the onboard documents, the flight program of the Soyuz TM-3, the program of joint activities of the main expedition and the visiting expedition aboard the Mir complex, and they "highlighted" the onboard documents—that is, together with the instructors they singled out the most important elements of the program and the operations associated with using vitally important onboard systems of the spacecraft and ensuring flight safety of the crew. Tomorrow all of the onboard documents would be stowed in the transport craft, but today they had to be kept under ultraviolet radiation so as to keep pathogenic microbes from entering the craft.

On the morning of the following day the crews rested. It was pleasant to sit on the riverbank with a fishing rod, all the more so because the fish were biting. And after lunch, back to work. The cosmonauts inspected the Soyuz TM-3 transport craft in the assembly and testing building. The transport craft had yet to be attached to its launch vehicle, and the rocket had to be positioned on the launching pad. It was the unanimous opinion of both crews that the craft had been excellently prepared for work, and there were no complaints.

A representative from the ballistic service of Flight Control Center reminded the cosmonauts of the specific details of approaching the Mir complex in the Soyuz TM-3 transport craft. It is very important in this case to



know the mutual positions of the ship and station during rendezvous, the lighting conditions provided by the sun and the calculated time to switch on the propulsion unit of Soyuz TM-3.

The cosmonauts attentively studied the list of cargo to be delivered aboard the complex. It included scientific apparatus, replacement units and mail. A few days before launching a package was received from Siberia containing ramson, a plant rich in vitamins that maintains its healing properties over a long period of time. It was decided to stow it aboard Soyuz TM-3 for Yu. Romanenko and A. Laveykin. The Soviet-Syrian crew was to bring Soviet and Syrian state flags, a commemorative medal dedicated to the joint flight and photographs to the Mir station.

On 19 July a state commission confirmed the composition of the main and back-up crews. Then a press conference was held for Soviet and foreign journalists.

Training in manual rendezvous and approach was started on the following day. In the evening a special edition of the wall newspaper APOGEY devoted to the joint Soviet-Syrian space flight was posted in Kosmonavt Hotel. An artist painted the "Heroes" in their national attire on an ancient Russian background. The cosmonauts, who had become fully proficient with their cameras, took some of the pictures for the wall newspaper. After all, cameras were to play a major role in the flight program.

Twenty-one July was the last day before launching. A. Viktorenko worked on the trainer from early morning. This additional training in manual rendezvous and approach was carried out at his request.

The training was followed by a traditional showing of the motion picture "The White Desert Sun." Mukhammed Faris and Munir Khabib had seen this film for the first time just prior to the launching of the "Taymyr" crew—Yu. Romanenko and A. Laveykin, but the second showing produced a significantly greater impression: In the 5 months since the launching of Soyuz TM-2, the Syrian cosmonauts had practically overcome the language barrier. After the film, the cosmonauts met with foreign journalists.

Silence descended upon Kosmonavt Hotel at 1800 hours: The "Vityaz" crew was resting before its departure for the launch site.

The cosmonauts were awakened at 0100 hours on 22 July. They underwent a prelaunch medical examination. The "Vityaz" crewmembers signed their autographs on the door of the room in which they had lived for the final days before take-off. This tradition was started with the first flights of our cosmonauts, and now, a person could quickly and easily reconstruct the chronology of manned space flights in the Soviet Union by walking along the halls of Kosmonavt Hotel.

It was now 0240 hours. Buses carrying the cosmonauts drove away from the hotel.

For two of them—A. Viktorenko and M. Faris—this was the first trip into space. There were many good wishes for the cosmonauts: They had grown very close with all who prepared them for the space flight. Instructors established good relations with the first Syrian cosmonauts. Mukhammed Faris and Munir Khabib found real friends in our country.

(To be concluded)

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### **History of Aerial Combat in First Period of Great Patriotic War**

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[Article by Col Yu. Kislyakov, military pilot 1st class, and Col (Res) V. Babich, candidate of military sciences: "History of Aerial Combat"]

[Text]

#### **The Great Patriotic War (The First Period)**

The air battles of the first period of the Great Patriotic War (22 June 1941 to 18 November 1942) were defensive. They recalled the last battles in the sky over Spain. I-15, I-153 and I-16 fighters, which made up 75 percent of our air force, fought fascist Me-109s. Qualitative superiority was on the side of the enemy: The Messerschmitt had better speed and altitude characteristics, and more powerful armament. When this is translated to the language of combat, it had the advantage in the first phases of combat—approach and attack. That is, the pilot was able to reduce range faster, and he was able to open fire from a greater range when chasing his opponent. This predetermined the offensive potential of the Me-109, which our principal fighter, the I-16, could counter only with high maneuverability. However, its lower turning time and radius became a real power to contend with only in the third phase of combat, when one opponent tried to outmaneuver the other and assume a position on the opponent's tail for aimed fire.

The inadequate speed and weakness of the I-16's fire compelled the pilot to defend himself and to seek all means to go over to the offensive. The moral factor acquired enormous power.

It should be recalled in this case that in the first Russian combat manual, the "moral element" was at the top of the list of factors influencing success. "Fearful caution deadens boldness and doubles the opponent's resourcefulness, and in the absence of energy, resources are utilized inadequately, which is followed by failure. On

the other hand coolness combined with swiftness and resourcefulness in decision making leads to the most advantageous position and to the final result."

Thus boldness in aerial combat acquired special, unique qualities, and it produced a result only when combined with proficiency. This was manifested in the tactics of the battles of the first period of the Great Patriotic War as the resolve to fight from a position of numerical inferiority and to make frontal attacks on Messerschmitts, and as the ability to ram the opponent to ward off a bomb attack on our troops or to rescue a comrade under enemy attack.

The expression "the ability to ram the opponent" is not used here accidentally. The literature often emphasizes only the valor and the high moral qualities of a pilot who rams the enemy, and it says nothing about the art of ramming. Ramming was usually employed after ammunition had run out, and its purpose was to hit (bring down) the enemy without fire. The pilot did not strike his opponent with the entire weight of his airplane; instead, he shaved off the opponent's tail or wing panel and aileron with his rotating propeller, after which the opponent's airplane became uncontrollable, and fell. There were three clear phases to aerial combat of this sort—closing in, attacking and disengaging. Successive fulfillment of these phases required a jeweler's precision, perfect handling of one's airplane and maximum endurance. A pilot who rammed his opponent successfully landed his aircraft only with a bent propeller, and after slight repairs the aircraft was returned to action.

Ramming is a combat tactic, it is a forced measure, and it was characteristic namely of the first period of the war. But when Yaks and La's entered into combat (in 1943), thrice-awarded Hero of the Soviet Union A. I. Pokryshkin wrote that ramming went out of fashion. And in September 1944 the Red Army air force commander published an order to the troops stating that ramming, which often resulted in the loss of our airplanes and pilots, had become obsolete. "Our fighters possess powerful weapons, and their technical flight characteristics are superior to those of all existing enemy fighters. Consequently ramming is no longer suitable in aerial combat against enemy airplanes of lower quality."

There were many sharp contradictions in the tactics of aerial combat in the first period of the war, but these contradictions were chiefly the product of the possibilities of the equipment and weapons. The existing limitations were what made it necessary to use the "closed ring" defensive combat formation, to use banked turns as the basis of combat (such combat was not viewed to be offensive combat), to provide cover to troops with separate pairs of aircraft without back-up, to fly bombers without fighter cover, and to dispense with a reserve. The fact was that there was simply nothing with which to provide cover and escort or to exploit an offensive.

Mention should be made here of the critical attitude some historians have expressed toward the tactics of fighters in the first period of the war. In I. Timokhovitch's book "V nebe voyny" [In the Sky of War], for example, the defensive ring used by I-16 pilots in battles against Messerschmitts is called a "swarm" formation, and it is accused of not producing any positive impact. And yet twice-awarded Hero of the Soviet Union A. Vorozheykin suggests an opposite point of view: "One could hardly think of a more successful defense for the I-16 than the ring. Our strength against Messerschmitts lay in the unity of the group.... The combat formation resembled a quickly turning circular saw blade: No matter where you tried to penetrate, you couldn't. By changing their position the airplanes extended their formation into the needed direction, spraying machinegun fire and sometimes launching rockets. The Messerschmitts raced back and forth at high speeds like frantic fish, and whenever they approached us, they were spun back by the sharp teeth of the saw."

Comparative analysis of the capabilities of the aviation equipment and weapons of the warring sides would show that in the first period of the war the well known formula of aerial combat, "altitude—speed—maneuver—fire," could not come into being and be put to use simply because the necessary material base was absent. The enemy had the advantage in relation to three of the four components of this formula. Even a very bold and experienced pilot could not attempt a vertical climb when his airplane climbed slower than the enemy's.

The groups of I-16s maintained an extremely tight formation, since increasing the intervals and distances made mutual support less effective, considering the weakness of fire. The 1940 field manual for fighter aviation required grouped flight of 30-40 fighters in combat formations which had to ensure concentrated, powerful and sudden strikes on the enemy: It required use of the entire offensive firepower of the aircraft coupled with simultaneous commitment of all fire weapons to combat, better controllability and maneuverability, and fast opening, closing and reforming of the formation.

These conclusions of the guidelines took almost no account of the experience in Spain. This is why they were rejected on the battlefield right at the beginning of the war. It was impossible to make a powerful, concentrated strike simultaneously by a large number of fighters. One of the first information bulletins to the troops noted: "...the suggestion that a closed combat formation provides better conditions for mutual support has no basis in fact." Our pilots ended up having to restructure their combat formation in the course of combat activities, which was not always felt to be desirable. So it was that the combat formation began to grow smaller—a trend that is still continuing today. Changes in the methods of combat revealed themselves distinctly after a year of war, when half of the airplane fleet of our fighter aviation was replaced with new equipment.

The enemy also made adjustments in his tactics. Their typical features included, first, a preference for surprise attack and for occupation of an initial position for attack from a superior altitude; second, an inclination to fight in the vertical plane; third, use of specially appointed flights or pairs patrolling for the withdrawal of lone fighters from the combat formation, which they would attack from above. German pilots were reluctant to engage in horizontal combat. They were noted for good coordination in group flight, for prompt augmentation of effort with the assistance of ground control, and for deep disposition of combat formations, which was made possible by radio communication. The enemy made wide use of stratagem and feints, and he avoided open combat when lacking in strength. In this case his speed advantage allowed him to withdraw quickly.

It was not easy to switch our fighter aviation to the new tactical rails. In his directives dated 9 June 1942, the Red Army air force commander noted the persisting adherence of fighters to defense, weak organization of coordination between regiments, uneconomical expenditure of forces (a large number of sorties without encountering the enemy), and the inability to concentrate effort in the most important sectors of combat, where the outcome of the latter would be decided. He ordered commanders and flight crews of fighter aviation to minimize the number of patrol sorties flown with the purpose of providing cover, to rotate airplanes into frontal airfields where they would maintain alert duty at a higher readiness for take-off, to organize observation of the air situation above the battlefield and prompt notification of alert fighters and, when necessary, to organize alert duty in the air by groups disposed in depth (the altitude of the top tier had to be not less than 3,500-4,000 meters).

"Standardization" in the methods of combat activities and in aerial combat had to be done away with. "The ability to attain an advantage in position and altitude by the beginning of an attack is the main indicator of a fighter pilot's maturity. Complete success in combat is guaranteed by a combination of the proficiency of air warriors and artful control by the commander." The initiative was to be wrested from the enemy by making a transition "from horizontal to vertical," by gaining control over altitude by means of a combat formation disposed in depth, by abandoning defensive "rings", and by rejecting the tendency to act continuously and in all places with unchanging pressure, since flight crews and the materiel have their endurance limits."

A month later the peoples commissar for defense sent an order to the troops explaining that the main mission of fighters was to annihilate enemy bombers, and to prevent them from dropping their bomb loads on our troops. The enemy's tactics of pinning our fighters down had to be opposed by our tactics of breaking through to bombers through covering screens. Payment of reward

money to pilots for knocking down airplanes was established. The order called for awarding the Hero of the Soviet Union title to pilots who knocked down 10 enemy fighters or 5 enemy bombers in aerial combat.

In the first period of the war the word "defensive" was applied not only to the tactics of aerial combat but also to missions. Directives from the headquarters of the Red Army air forces dated 28 July 1942 stated: "...when patrolling, when providing cover to troops and when providing immediate escort to bombers (attack aircraft), fighters should not seek out the enemy; instead, they should limit their actions to looking out for attacking aircraft." A transition to active methods of combat activities—group interception of enemy bombers behind the front line and "free hunting"—was felt to be needed.

The first of these methods required organization of control over the airspace above enemy territory. Visual observation posts equipped with radio sets linked to air division command posts were organized by the 8th and 16th air armies at Stalingrad. On detecting enemy airplanes, officers manning these posts estimated the air situation, called in a fighter patrol, guided the latter to the target and kept the group commander informed of any changes. The very first steps of organizing visual guidance and combat control showed that the air strikes by fighters had become prompt and accurate.

The second method—"free hunting," which also foresaw transfer of the effort of fighters beyond the front line, called for independent actions by pairs and flights independently of the control system. Groups of "hunter" fighters were created in each division. They were manned by the best air warriors—outstanding aerobatic pilots and marksmen who had mastered the tactics of "hunting" and who were capable of making decisions on the basis of their own estimates of the situation.

The most experienced commanders and pilots were entrusted with the new, more complex missions of gaining tactical superiority in the air. The best-trained fighter units were assigned to aggressive operations over enemy territory.

Special attention was also turned to procedures, improvement of which was dictated by the continual inflow of new aviation equipment to the front. Combat procedures corresponding to the greater possibilities of the airplanes and weapons had to be developed. The Red Army air force commander required division commanders to search for new methods of action, tactics and combat maneuvers. Encouraging innovative pilots to participate was recommended. The best developments were brought to the awareness of all fighter regiments, and they were utilized with regard for the specific situations.

The search for and introduction of new directions in the tactics of aerial combat could not be imagined without an analysis of the strong and weak sides of enemy

equipment and tactics. The command's directive "to attack bombers on priority" necessitated detailed assessment of their defensive capabilities and a knowledge of their vulnerable points. The analysis showed that the crew, engines and the gasoline and oil tanks of fascist Junkers' were poorly protected; when attacked directly from behind the tail of the airplane, they offered a very small target area that was hard to hit. Therefore attack at angles of approach of 1/4-2/4, at which the vulnerable points were transformed into a continuous area with 3x3 dimensions, was believed to be the most advantageous. Large-caliber armor-piercing bullets and 20-millimeter shells penetrated the armor at a 90o angle of impact from practically all ranges of effective fire, and at impact angles of up to 30o from a range of 100 meters.

The speed advantage of our new fighters was relatively slight, and therefore an altitude reserve had to first be accumulated to permit swift straight pursuit of fascist bombers. Junkers' and Dorniers could not evade attack by flying upward because of their poor rate of climb (4 m/sec and 7 m/sec at an altitude of 5,000 m respectively), but these airplanes could dive sharply and stably, and therefore their pilots often utilized this maneuver.

The principal means of defense against our fighters used by the enemy was group flight. Bombers in a close combat formation composed a continuous fire ring overlapping in the rear hemisphere. Considering this, our fighters based their tactics on the principle of first "breaking up the combat formation." This was expressed in practical terms as successive attacks at large angles of approach and at minimum time intervals. This method pursued two goals: Bringing down the enemy (desirably the group leader) with successful aimed fire; if accurate aiming did not occur, disturbing the group's coordination and annihilating it in parts in subsequent passes. The most advantageous direction of an attack intended to break up a group was against the front flank, while that of an attack intended for destruction was against the rear flank, with the attack beginning above the zone of defensive fire. The rules of attack for a pair were: Converging with the enemy in the sector covered by only a single gunner; firing weapons simultaneously by both pilots; observing safety measures, since a simultaneous attack is made on converging axes; attacking in such a way that two airplanes would be within the optimum attack zone and a possibility for transferring fire would exist.

Bombers brought together in a group acquired the advantages of collective fire, but they lost maneuverability. A cumbersome, hard-to-turn group could not evade a fighter by diving as a lone airplane could, and the average speed of the group was lower because the leader provided slack to allow the followers to maintain their positions in the formation. Concealment of a group was worse, and a group could be detected earlier, making it easier for fighters to maneuver and to approach the

group from an advantageous direction. Recommendations on how to fight bombers noted that fighters were allowed time to think out their plan of combat and to execute it in organized fashion, as well as to utilize stratagem.

The first period of the Great Patriotic War was one of defensive actions by our air forces. But the defense was active, as could be seen from this figure: 12,750 fascist airplanes were annihilated. The real groundwork for beginning the struggle for air superiority seized by the enemy in 1941 was created during this time. By December 1942 the percentage of new airplanes in the fighter aviation inventory climbed from 25 (at the beginning of the war) to 67. Flight crews acquired valuable experience in fighting a very strong and numerically superior enemy, and the principles of combat tactics with the new airplanes were developed, to be subsequently improved on a continuing basis. A fighter control system was organized and practically tested at Leningrad and Stalingrad. The results of the first air battles of our pilots aboard the new airplanes showed that the Soviet aircraft were not inferior in any way to fascist Me-109s. The airplane fleet of fighter aviation underwent continual change not only qualitatively but also quantitatively: By the beginning of the counteroffensive at Stalingrad, 19 November 1942, we managed to create a 1.1:1 numerical advantage over enemy aviation, and a 1.8:1 advantage in fighters, which went a long way to predetermine the subsequent struggle in the air.

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